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HOME CARPENTR

FOR

HANDY MEN

A Book of Practical Instruction

IN

ALL KINDS OF CONSTRUCTIVE AND DECORATIVE WOR
IN WOOD THAT CAN BE DONE BY THE AMATEUR

IN

HOUSE, GARDEN AND FARMSTEAD

BY

FRANCIS CHILTON-YOUNG
AUTHOR OF "EVERY MAN HIS OWN MECHANIC"
ETC.

WITH UPWARDS OF 550 ILLUSTRATIONS
FROM THE PEN AND PENCIL OF THE AUTHOR

LONDON
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EVERY MAN HIS OWN MECHANIC.

A Guide for Amateurs in HOUSEHOLD CARPENTRY AND JOINERY, ORNAMENTAL AND CONSTRUCTIONAL CARPENTRY AND JOINERY, and HOUSEHOLD BUILDING, ART AND PRACTICE. New, Revised and Enlarged Edition, **with about 900 Illustrations of Tools, Processes, Buildings, etc.**

"There is a fund of solid information of every kind in the work before us, which entitles it to the proud distinction of being *a complete 'vade-mecum' of the subjects upon which it treats.*"—THE DAILY TELEGRAPH.

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PREFACE.

"HOME CARPENTRY FOR HANDY MEN" may be regarded in every way as a necessary sequel to "EVERY MAN HIS OWN MECHANIC". The general aim and purpose of the two volumes may be briefly summed up in a few words as follows:—In "EVERY MAN HIS OWN MECHANIC" the amateur carpenter is told what woods and tools are requisite and *how* to use them for all building purposes, and especially for operations in Carpentry and Joinery; whereas in "HOME CARPENTRY FOR HANDY MEN" he is told *what* to do in the three leading departments of house and home, namely, the house itself, the garden, and the farmstead, in order to beautify and adorn the house, to add to the attractions of the garden, and to render the farmstead thoroughly useful and well-fitted for the amateur's purpose in every respect. Resembling "EVERY MAN HIS OWN MECHANIC," which is divided into three parts, namely, Constructural Carpentry, Ornamental Carpentry, and House Building and Repairing in general, thus forming a trilogy or triple division of the entire subject into three portions, each one of which is complete in itself, "HOME CARPENTRY FOR HANDY MEN" has also been subjected to a tripartite division in the same manner, being divided into three parts, each complete in itself and independent of the others, the parts being separately and severally devoted—firstly to Carpentry and Joinery for the House, secondly Carpentry and Joinery for the Garden, and thirdly Carpentry and Joinery for the Farmstead.

There is one point in the entire volume which renders it peculiarly valuable, and, it may be said, unique in itself. *It is the result and outcome of actual practical experience,* for there is nothing described, from the first of its pages to the last, but those things which the writer has done himself, or, in some few cases, have been done by others, the former preponderating in the proportion of ten to one at the very least. The text of every portion, too, that so requires it has been illustrated and elucidated by working drawings to scale, diagrams, or sketches, most of which are due to the pen and pencil of the writer himself, and have been put on paper in a manner which, it is hoped, will be clear and intelligible even to the dullest comprehension, the drawings helping to render the text such as may be understood in every respect, and the text setting forth and explaining that which has to be done to the smallest and most trivial detail.

F. C.-Y.

September, 1895.

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HOME CARPENTRY FOR HANDY MEN.

PART I.

Carpentry and Joinery for the House.

> Therein I must play the workman.
> —*Cymbeline*, iv. 1.

CHAPTER I.

INTRODUCTORY.—MAN'S SUPERIORITY IN THE USE OF TOOLS—ABOUT HOBBIES IN GENERAL AND CARPENTRY IN PARTICULAR.

The Evolution of Man—Man distinguished as a Tool-using Animal—Superiority of Man in the Use of Tools—Development of the Human Hand—The Discovery of Tools—Another Reason for Man's Superiority—Workmen, Professional and Amateur—Desirability of Hobbies—The Eight Hours' Movement—Choice of a Hobby—Practical Handicraft for Amateur Workmen—A few Words about Mending—Advantages of Ability to Repair Damages—*Every Man his Own Mechanic*—Course of Procedure in present Volume—Division of the present Volume into Parts—Difficulty of avoiding Egotism—General Subject Matter of the First Part—Virgil and the "Claimant"—Improvement on Things as they are—The Ugliness of some Kinds of Doors—The Bareness and Baldness of Modern Houses—Workshops and Workshop Appliances—Recapitulatory.

The evolution of man.

1. Of all the various theories that have occupied the minds of the most profound thinkers during the latter part of this the nineteenth century none, perhaps, is more important, or possesses a deeper interest for mankind in general, than that of the evolution of man himself, —that is to say, the story of the successive steps or stages by which the body of man as an animal has suffered development from the first germ of life to the perfect living organism with which the great Creator of the universe chose to complete and crown His mighty work of creation,—even as with a coping-stone to serve as a shrine for the soul and spirit which should serve to distinguish man and place him at the head of the animal world as a sentient being—a fitting receptacle for the powers of thought and action which raise him far above all other creatures endowed with life and power of motion from place to place during his temporary sojourn and tarrying at the threshold

of the spirit world which he must inevitably enter sooner or later, as God shall please, in accordance with His irresistible fiat of "dust thou art, and unto dust shalt thou return," issued against the body when the purposes for which it serves shall have been accomplished.

Man distinguished as a tool-using animal.

2. With the gradual unfolding of the successive stages of man's growth or development, from the Alpha of his genesis, through the prime of life and vigour of manhood, to the Omega of the decadence of life and death of the body, we have nothing whatever to do in a work of this description,—nothing whatever to do with the theory that is yet being subjected to elaboration and most careful emendation as time goes on; but much to do with one of the chief results that have been hammered out, as it were, by the theorists from the matter before them,—namely, that from a purely scientific point of view, man stands forth conspicuous from the rest of the animal world as a tool-using animal—an animal that alone possesses the power and capability of administering to his wants by agencies that form no part of himself, that is to say, not by teeth, which in many, indeed, in far the most of the lower animals, serve to grip and sever; not by claws, that serve to scratch and rend; not by hoofs, that serve to deliver blows,—but by tools, which, when wielded by man, serve to do all these things with greater force, with greater speed, with greater precision, and with greater effect. Tools, in fact, do better work than the natural powers of teeth and claws and hoofs.

Superiority of man in the use of tools.

3. Existence as an animal during his sojourn on the earth has been, is, and will be compulsory on man; for, unless he were an animal, he could not possibly sustain life on the world's surface, and carry out the various kinds of work that God has given him to do; but he stands forth prominent among animals by his power to use tools, appliances, and engines of widely different kinds, all of his own invention and contrivance, without the aid of which nothing could have been done that has been done, from the simpler kinds of work that were effected in the most ancient times by the most primitive of tools, to the structure of mighty ironclads of thousands of tons in burden, and the piercing and tunnelling of almost impassable mountain chains by machines that are as wonderful themselves in construction and effect as the things that are made by their operation.

4. Speaking of "the arrest of man," that is to say, the stoppage of the further development of man as an animal at his arrival on perfection when Nature had achieved her finished work, Professor Henry Drummond, in his *Lowell Lectures on the Evolution of Man*, delivered at Boston, U.S.A., in

April, 1893, infers that with the development of the human hand, her last and greatest effort in forming an instrument of prehension, the onward and upward work of Nature ceased. From the primitive hand of the amœba [Gr. *amoibe*, change], a tiny rhizopod [Gr. *rhiza*, root; *pous*, *podos*, foot], so called from its capability of altering its form at pleasure, one of whose Protean shapes is shown on an enlarged scale in the accompanying illustration (Fig. 1), Nature pursued the work of development until the chimpanzee hand was reached (Fig. 2). And then, says Drummond, "even for the use of her highest product," namely man, "Nature has not been able to make anything much more perfect than the hand of this anthropoid ape. It is probable that Nature could take out no new patent in this direction. The causes up to this point which furthered the evolution of the hand had begun to cease to act. There came a time when necessities became too numerous and too varied for anatomical adaptations to keep pace with them. Then came a fatal day for the hand when the discovery of tools was made. Henceforth what the hand used to do, and was slowly becoming adapted to do better, was to be done by external appliances. Tools are external hands. Levers are the extensions of the bones of the arm. Hammers are callous substitutes for the fists. Knives do the work of nails. The day that the cave-man first split the bone of a bear by thrusting a stick in it and striking it home with a stone, the doom of the hand was sealed." "So far shalt thou go and no farther," seems to have been the pronunciamento and ukase of Almighty God at this point. In the perfection of the human hand (Fig. 3) man himself was perfected; and, being perfect, whatsoever the hand found to do was to be done with mightier might by the agency and instrumentality of tools.

Development of the human hand.

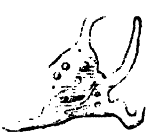


FIG. 1. A Form of the Amœba.

The discovery of tools.

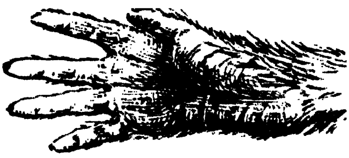


FIG. 2. Hand of Chimpanzee.

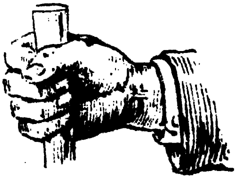


FIG. 3. Hand of Man.

5. Man, then, is superior to the rest of the animal creation by the use of tools which he fashions for his own use; and it is well for him that he is, for if the animals who are superior to him in bodily strength, speed, activity, agility, powers of vision and other qualities, had the power of making tools for increasing and intensifying these faculties, man would soon be completely out of the running, so to speak. But God has said: "The fear of you and the

Another reason for man's superiority.

dread of you shall be upon every beast of the earth, and upon every fowl of the air, upon all that moveth upon the earth, and upon all the fishes of the sea; into your hands are they delivered." And by this promise, which will not and cannot be broken, superior though he be by the means that have been mentioned above, man, though he fall to the rear in the animal world in many a point in which the beasts of the earth excel him, yet, by the immutable decree of God, stands forth even in his weakness as the lord and master of them all.

Workmen, professional and amateur.

6. But, it will be urged, it is not given to every man to make use of tools, and so to exhibit his superiority in this respect. To this it may be replied that every man may make use of tools of some kind or another if he will, although it is given to some to use them with far greater facility and effect than it is to others. Thus, as a rule, the professional workman through constant practice will, in ninety and nine cases out of a hundred, excel the amateur workman in the handling and use of the tools that he manipulates in the pursuance of his special trade; but this constitutes no reason why the amateur should shrink from making use of tools in any way whatever. Indeed, in the hundredth case, as an exception to the rule the amateur will outstrip the professional; and this notably in turning and ornamental work, including wood-carving and fret-cutting, as well as inlaying, marquetry and parquetry, in which many an amateur with whom I am acquainted could give the professional many points and yet beat him hollow. Nevertheless, for very superiority in handicraft men respect and honour each the other; and there is no need to utter the *quasi* warning which appeared on the horse-trappings of Henry VIII. of England at his meeting with Francis I. of France on the famous "Field of the Cloth of Gold"—horse-trappings on one side of homely frieze, and on the other rich tissue heavily interwoven with threads of gold, and which bore the legend—

> "Cloth of gold, do not despise
> Though thou'rt matched with cloth of frieze.
> Cloth of frieze, be not too bold
> Though thou'rt matched with cloth of gold;"—

which may be taken in our case, and from our point of view, so as to imply that the more highly skilled artificer, stand in which class he may, should never look askance with a sneer at the less highly finished work of him who is his inferior in skill, nor should the latter pride himself too much on the work that he is enabled to turn out, on the principle of those who think that all their geese are swans; but, while recognising the superiority of the master-hand, be satisfied with his own humbler efforts, though he strive in all humility to improve the quality of his own work by taking example by and from that which others can do better.

Desirability of hobbies.

7. Most desirable it is that every man should have a hobby, and pursue this hobby whenever he has leisure for its prosecution to the very top of his bent. Were this the case, the Devil would have far less trouble than he has at present in providing mischief for idle hands to do; and the time of the judges of England, Scotland, and Ireland, would be far less taken up in adjusting quarrels arising out of knavery, roguery, and impurity, to the prejudice of suitors in cases of genuine importance, which are too often thrust into the background by the undue time taken up in sifting details, which, like dirty linen, were better purged in privacy and the obscurity that they deserve. Of a surety, the possession and prosecution of a hobby which affords food for thought at all times and even when one's hands may be employed mechanically at accustomed handicraft, would do more than any amount of legislation to hold crime and drunkenness and debauchery in check, which are frequently the results of having nothing of an elevating character to employ the mind, and, above all, to diminish the demoralising influences of public-houses, and political clubs, which, after all, are mostly public-houses in disguise, to which many a working man is mainly driven by discomfort at home, coupled with the want of opportunity and facility of taking up some kind of employment for spare time other than that of the trade or calling by which he has to earn his daily bread.

The eight hours' movement.

8. Daily leisure is desirable for every man, but as a general rule it is not many who can attain it; and its utility to the man who is lucky enough to have it depends entirely on the way it is employed and the purposes to which it is devoted. In the mind of trades-unionists of the present day, whose great aim and object seems to be to level down rather than level up, and to whom the number 8 appears to bear the mystic influence that was attached in ancient times to the numbers 3, 7, and 12, the prevailing notion of terrestrial elysium, or the earthly paradise, is apparently—

"Eight hours' work; eight hours' play;
Eight hours' sleep; and eight bob a day;"

—which no one would begrudge them could it be attained. But the question is, to what would the eight hours' playtime be devoted? Something must be done, either for good or for evil, throughout the eight hours of leisure; for no one would spend it in listless inactivity; and if it were given to work which would tend to mental improvement, or to checking daily pulls on purse or pocket, it would be well that the eight hours to be spent in so-called play could be placed at the working man's disposal. It is to be feared, however, that by too many they would be passed on the downward grade, and thus prove the means of rendering the last state of the idle and viciously inclined worse than the first. I am afraid that employés in the position of clerks and assistants in business houses, who, as a rule, would be far more inclined from education and predilection to turn such playtime to good account, would never get it, and so be placed on a level with those who ply some handicraft. Further, from experience and personal knowledge, I am sure it would never be attained by professional men, who, being their own masters as it is said, are the hardest taskmasters to themselves that men can possibly have.

9. From what I have just said it will be apparent to every one who will take the trouble to get at the pith and marrow of the foregoing paragraph, that I consider it to be desirable, if not absolutely necessary, that any man who can command eight hours leisure out of the twenty-four that compose day and night,—who has, in fact, one half of his waking time at his disposal, —should have some hobby, which he should follow up with some degree of enthusiasm. This I certainly do; and I go even beyond this, for I think that every one who has any spare time at his disposal, be it ever so little, and occurring at irregular intervals into the bargain, should have something to which he can turn his mind when such intervals of leisure intervene, and that the "something" should savour of the nature of practical work. But this will depend in a great measure on the nature of his daily avocations, whether they be sedentary or of an active character. If the latter, I do not wonder at the preference shown by any man for reading, music, painting, drawing, or investigation with the microscope, or the study of history or any of the 'ologies, or indulgence in scientific pursuits. But, on the other hand, if his occupation be sedentary, let him take up and turn his attention to carpentry and joinery, in one or other of its varied branches, as a pleasing and indeed profitable amusement- in wet weather, even though he prefer walking, riding, cycling, or boating when dry.

Choice of a hobby.

10. "Oh!" I daresay some will object, "I do not see what can be done in the way of carpentry and joinery, and what real and effective benefit can be derived from it." Well! in the first place I may reply, there is always some little job to be done in mending or repairing, and in the second a man's attention may be turned to making or manufacturing, in which there is even greater scope than in repairing; for mending, after all, will be nothing more

than casual matter to be taken up when any casualty unfortunately happens; whereas, in making, there may be always something or other on the stocks that may be taken up when leisure serves, and laid by again when time for its prosecution is wanting, thus to be wrought at now and again, until the work, long under hand, perhaps, stands forth to view in a perfectly finished state. It is a long lane, verily, that has no turning; and, in like manner, it must be a long and elaborate piece of work that hangs so heavily on hand, and demands so much time, that there are heavy odds against its completion.

Practical handicraft for amateur workmen.

11. "Well," our amateur workman will again say, who, let us imagine, is half inclined to take a little jobbing work, in the way of carpentry and joinery in hand, and half disposed to let it alone, "what is there likely to be done in the way of mending to which I may turn my hand?" Much, every way—at least, I find it so myself; for seldom does a week pass by without something or other being sent into dock to which I am compelled to give my attention. Now it is some unhappy blindroller that has gone wrong, or a chair that has cast its leg,—very much after the fashion that a lobster casts a claw; for, remember, when a chair loses a leg, or gets weak in its back, or parts company with it, nobody ever does it; but the delinquent member "comes off" in somebody's hand, or has been "picked up" on the floor, until you begin to think that, like persons who get permeated with a notion that life is not worth the living, they are tempted to rush unbidden into eternity,—so furniture, in some cases, gets tired of being used, or, let me say, "sat upon," and, being thus disturbed in body, takes incontinently to *felo de se.*

A few words about mending.

12. Another thing that I have noticed in chairs of a suicidal tendency is the deliberate and wilful act of bringing destruction on their own seats; and this especially with cane-bottomed chairs. No one, as far as I have been able to discover, ever stands on them, or uses them as a means of effecting a nearer approach to pictures that require taking up or pulling down, or restoring motion to blinds that get stuck hard and fast, and will not move, or the removal and subsequent replacement of curtains at the inevitable spring cleaning, or the approach of winter. Well, with the aid of a little glue, some screws, some wire nails, and some ordinary tools, all these mishaps can be put to rights; and the torn cane of the

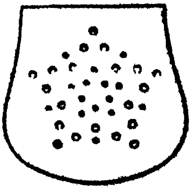


Fig. 4. American Three-ply Chair Seat.

Advantages of ability to repair damages.

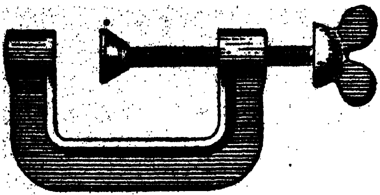


FIG. 5. Ordinary Cramp (Japanned).

seatless chairs can be replaced by means of some of the American three-ply seats, which cost but a few pence each, and can be easily cut to size, put in place and fastened down, thus putting the chairs in a fit condition to go out of hospital and return to their duty. The last thing of this kind that I myself had to take in hand was the repair of the back of a mahogany chair (Fig. 6), the back of which was solid in itself, and badly adorned with the rude semblance of a shield in carved work. It had been originally attached to the back rail of the frame on which the seat was placed by glue and screws, and bore traces of having parted company with the lower part of the structure before. Portions, too, of the back had got split off, and remained clinging to the seat. These were soon detached, and fastened to the back in their proper places by glue —waterproof glue, which I always use on these occasions,—and held in position by a slip of wood placed over them and held down to the back by cramps (Fig. 5), until the back and its bits had become indissolubly united. To bore some holes through back and into back rail of seat with a brace and Norwegian bit of suitable size, and to bring back and seat together once more by means of some No. 10 screws, 1¾ inches in length, was but the work of a few minutes; and the chair was itself once more. This was a back that had been inconsiderate enough to "come off" in the maidservant's hand. Had I sent it to be repaired it would have had to be carried one and a half miles to the cabinet-maker, and ultimately brought back over the same distance; it would in all probability have been weeks before it came home to roost, and I should have had to pay at the least 2s. 6d. for the job. By taking it in hand myself it did not cost me so much as a penny to put it right, leaving time out of the reckoning. It was fit for its work again in about twenty-four hours after it had been picked up "severely wounded," and I saved 2s. 6d. which, according to the principle that "a penny saved is a penny gained" was a gain to that amount. And now, my amateur friend, who may have been thinking "To do or not to do, that is the question," which are Shakespeare's own words with a trifling difference, you may easily recognise the advantages of doing your own repairs; and you will recognise them still more if you remunerate yourself for your work at the rate at which the jobbing carpenter

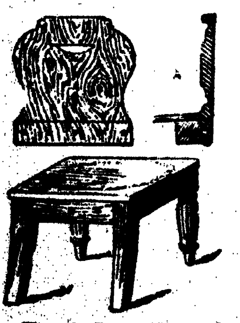


FIG. 6. Back View of Broken Hall Chair. A. Section showing Fixing of Back to Rail, supporting Seat.

or cabinet maker would have charged you for the necessary repairs, and put it aside for use on your next holiday. I say this because I have generally found that at whatever rate one may estimate the expenses of a holiday, whether for a longer or shorter period, the best and safest way of getting at the actual cost is to multiply the original estimate by two, and to the result obtained add half the sum that the trip is at first reckoned to be likely to cost. Thus, according to algebraic formula, if x = original estimate, $\overline{x \times 2} + \overline{x \div 2} = 2{\cdot}5\,x$ will be the actual cost, which, the experience of my various readers will tell them, approximates very closely to the truth.

"Every Man his Own Mechanic."

Course of procedure in present volume.

13. But it is not so much about mending that I intend to talk to my readers in this volume as about making, and that will be making of a peculiar kind. Any reader who will consult the title-page will find that I am credited with having written "once upon a time," as the old fairy tales usually have it, a book called *Every Man his Own Mechanic* which, if he does not already possess it, he ought to purchase. If asked the reason why, I must answer that I have already said a good deal in that book about mending, if I remember rightly; and that if I resort to repetition, such a repetition, after the manner of the repetitions of the heathen, will be but vain or idle, and therefore unfair alike both to those readers who possess the book I have named and to my publishers, who would far rather that it should be a decent supplement or sequel to the other than a palpable *réchauffé*, or serving up anew of its contents. I shall do my level best both to avoid as much as possible going over ground that I have already trodden. I must, indeed, speak of woods and processes; but I shall touch on these, not as integral portions of the volume itself, occupying and devoting entire chapters to their description, but merely in connection with the description of the articles themselves in whose construction they are employed; but even this I trust will be found sufficient by the readers who do not possess and do not intend to provide themselves with *Every Man his Own Mechanic*. Again, in the interest of such readers, I must touch on tools, and even devote a chapter to their consideration; but instead of dealing with tools generally, describing every kind that had come under my cognisance at one time or another, I shall only take such tools as are necessary, more or less, for the work that it is proposed to do, and, as in the case of woods, touch on any tool that may have been accidentally omitted, and that is wanted for the special work under consideration, in connection with the work itself. Thus far I have ventured to indicate the course I propose to adopt with regard to the points already mentioned; and now I

will endeavour to give the reader some idea of what I wish and hope to do in the present volume.

14. In accordance with the plan pursued in *Every Man his Own Mechanic*, which was divided into three parts, namely, "Household Carpentry and Joinery," "Ornamental and Constructive Carpentry," and "Household Building Art and Practice," I intend to make a trilogy of it, after the manner of the old Greek writers of tragedies, who used in some cases to group three of their plays together in proper sequence, the one leading up to the other, although each was complete and perfect in itself. Thus Part I. may be described as containing instructions, hints and suggestions for Home Carpentry within the House; Part II. as dealing in the same way with Home Carpentry about the Exterior of the House and in the Garden; and Part III. with Home Carpentry for the Farmstead,—if I may be permitted to use this expression to indicate such a portion of the surroundings of the house for plant and buildings intended for the use and shelter of such animals, biped and quadruped, as the owner of the dwelling may be disposed to keep; and with this a slower and more precise way of dealing with the special titles of the three parts presents itself, Part I. being Home Carpentry for the House; Part II., Home Carpentry for the Garden, and Part III., Home Carpentry for the Farmstead. Each forms a subject distinct and separate in itself, and each demands distinct and separate treatment. Much that will be contained in each Part will be the result of actual treatment—a description of things made either by myself or under my directions for the improvement of the houses which at various times have formed my home, for their better adaptation to the convenience of my family and myself, and for their ornamentation. I have always been fond of making a place "look pretty," as it is called; in fact, I have an inclination for adaptation and improvement which, as far as I am concerned, is utterly irresistible, and I hope, before the end of the volume is reached, to have inoculated every reader with a desire to go and do likewise.

Division of the present volume into parts.

15. In a book so much of which must take the form of a personal narrative of things done by one's own hands, or, as I have already said, under my own direction, egotism, or the frequent use of the capital "I," is well nigh unavoidable, though possibly it might be avoided altogether by reverting to circumlocution. As it is adopted generally to avoid this, and for convenience sake, I trust it will be held to be pardonable and admitting of reasonable excuse. In a book which goes forth from the first under my own name, and not anonymously, as did every edition of *Every Man*

Difficulty of avoiding egotism.

his Own Mechanic, if I remember rightly, until the tenth, it would be mere affectation to speak of myself periphrastically as the writer. That every book, if possible, should go forth with the *imprimatur* of the writer's name is a safeguard not only to the public and the publishers, but to the writer himself. A member of a very eminent firm of publishers who knew to whom the authorship of my first book was due, on meeting me one day said to me: "I had a letter the other day from a man who claimed to be the author of *Every Man his Own Mechanic*." "Did you?" I replied, and then continued: "Well, as you are acquainted with the real Simon Pure, you had no trouble in disposing of his claim." This trading on another man's capital is often resorted to in the case of writers who send forth their books anonymously. I have met with more than one instance of it

General subject matter of the First Part.

16. And now let us endeavour to determine in some measure what will be the principal subject matter of the First Part. It will be something like handing the reader the *menu* at a public dinner, or a *table d'hôte*, showing him what he is about to receive: and having this I trust he will be able to say his grace before reception with some satisfaction, and after reception in terms still stronger I do not say that the treatment of the subjects indicated will follow the order in which they are set forth here. They may and they may not; but it is more probable that they may not than that they may, because in the course of writing a mode of arrangement suggests itself which is decidedly better than the rough-hewn programme that is at first placed before the reader. Generally speaking, the subject matter of Part I. will deal with the making of fittings calculated to impart a better finish, and add convenience and utility to the interior of the dwelling, and the supply of additions to the structure which are too often neglected by the builder. There are many things of this kind that may be provided by the owner or occupant as the case may be, in all parts of the house; but it will be done with this difference, that the man who owns the house he lives in, and intends to keep it, knows perfectly well that by every addition he makes he is increasing the value of his own property; whereas a man who is merely an occupant of the house *pro tem.* is, or ought to be, fully aware that on the "*Sic vos non vobis*" principle, he is increasing the value of another man's property at his own expense.

17. My friends tell me that I have a very bad habit of falling back upon Latin; and to this I will at once plead guilty, adding in extenuation that I had Latin ground into me to such an extent during my school life that it is a matter of considerable difficulty for me to avoid it. Many of my readers

Virgil and the "Claimant".

will know at once what I mean; and for the benefit of those who do not, I will tell the story as briefly as possible; for I believe in making a book on practical matters as light and chatty as possible by little digressions and discursions. Virgil, or Vergil, as the pedantic like to write his name, was a Latin poet who lived in the time of the Roman Emperor Augustus Cæsar, at whose court he frequently made his appearance. In the hope of securing a tolerably big lift up life's ladder, Virgil, to use an expression culled from low English, had heavily "cracked up" Augustus in a couple of lines, in which he attributed to his imperial master a power on earth equal with that which was exercised by Jove in the realms above. These he scribbled on the big doors of the palace, designedly omitting to add his name as author. Augustus, feeling intensely flattered, tried his best to find out who the flatterer might be; and as nobody owned up to the act and deed, they were at last fathered by a poetaster named Bathyllus, who thought he was pretty safe in making the appropriation, and profiting by it. Virgil's next move was to put on the palace doors the words "*Sic vos non vobis*," four times repeated; and the emperor on reading them asked for the completion of the lines which had been written under the previous couplet placed thereon by Virgil. Many tried hard to do so, Bathyllus doubtless among the number; and then Virgil completed his quatrain, which, when rendered straitly into English, means:—"Thus ye not for yourselves" —in the following manner:—

> "I penned these lines; another bore the honours.
> Thus ye, O birds, build not nests for yourselves,
> Thus ye, O sheep, bear not fleeces for yourselves,
> Thus ye, O bees, make not honey for yourselves,
> Thus ye, O oxen, draw not ploughs for yourselves."

By this artifice Virgil scored, and made Bathyllus the laughing stock of Rome. As we have already seen, there are those who are knavish enough to try this sort of thing even in the present day. Possibly they never heard or read the little story told above. Newspapers, please copy for the general good.

Improvement on things as they are.

18. To go back, however, to the main point: there may be many who are disposed to think it is well nigh as impossible to improve a house after it is pronounced to be "finished" by the builder, as it is to gild refined gold, or to paint the lily. One is driven sometimes to use old similes, though I would much rather have given the kaleidoscope of thought a twist, and written instead—"as it is to add to the ugliness, facial and mental, of Ally Sloper," who has certainly had all that is possible done for him in these respects by the author of his being. As far as my

experience goes, I have found that whatever builders may do in the present day, when local boards are fidgetty and fussy, and inspectors restless and active, they never did an atom more than they could help doing in times past —that is to say, middle-past of nineteenth-century times—and that, as far as ornament and tasteful finish went, the houses I have lived in have been of the baldest and barest description in these respects. I have, nevertheless, always contrived to render and leave them far more akin to a "thing of beauty" when I went out of them, than they were when I went into them, both inside, outside, and round about the place. What, for example, can be uglier in the way of doors than those which are known in the building trade as "bead and butt," "bead and flush," and "ledge" doors? Yet, I have altogether altered the appearance of some of these, and made them fit to look at with some degree of pleasure and satisfaction to the eye, with very little material and no very great amount of trouble and expenditure of time. It is to show how I have contrived to do this, and managed to carry out many other things besides, that I have been prompted to produce this volume as a sequel, as I have already said, to *Every Man his Own Mechanic*, in which I sought to the best of my power to show *how*, and with what tools, different kinds of work might be done, just as in the present volume I hope to be able to show *what* may be done, and to point out the most efficient modes and methods of doing it.

The ugliness of some kinds of doors.

19. Again, let me ask occupants of many modern houses, whether as owners or tenants, if they have ever found a house to be exactly suited to their requirements on entering into residence therein, or in any way so replete with fittings and so well arranged as to meet and satisfy their own private and personal ideas of what a house ought to be. I never did throughout my life, and I may safely say that never in the whole course of my existence, have I been into and through a house without immediately noting a variety of points in which it might be rendered far more useful and ornamental than it was, and settling straight off in my own mind the points in which I would certainly endeavour to improve it, if I decided on making it my home. For example, entrance halls and passages have been destitute of anything and everything in the way of fittings that generally take the form of fixtures rather than of furniture, and the following of stereotyped forms and fashions with regard to staircases and other structural parts had tended to abridge space and promote discomfort. In many a room which from its position in the house and the purpose it was intended to serve, needed far more decorative work by way of finish than it possessed, perpendicular

The bareness and baldness of modern houses.

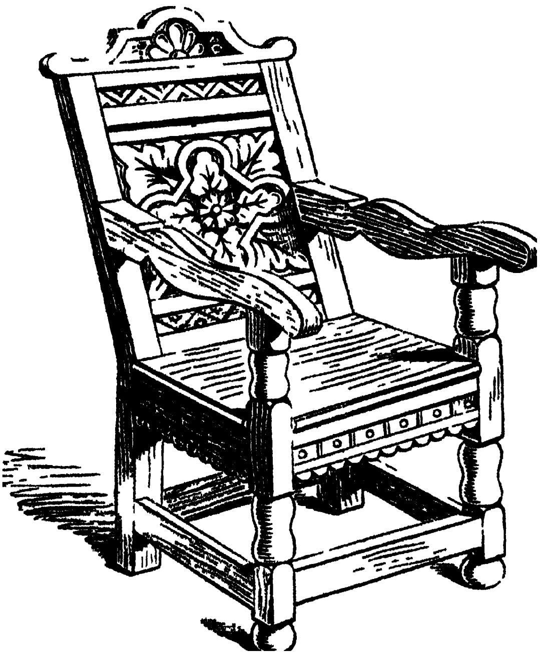
walls met horizontal ceiling in a rigid line, and at what the plasterer intended to be rectangular throughout its length, unbroken by the slightest attempt at cornice to mask the stiffness and sharpness of the section. As for cupboards in recesses formed by projecting chimney breasts there were none, neither dwarf cupboards in sitting-rooms, nor hanging cupboards in bedrooms. Ugly wedge-shaped recesses yawned under staircases, without any attempt having been made to turn them to some useful purpose. Kitchens presented no convenience in the way of overmantels for the reception of many a small article that needs to be stowed away in some safe and easily remembered nook, in which hands could be quickly laid upon it at any moment when it might be wanted in a hurry. The only place available for the bestowal of small casks, bottles, etc. in the cellar was the floor, which was of bare earth, concrete, brick, or wood as the case might be. All was barren from Dan to Beersheba,—that is to say, from cellar to attic—and to render the whole place comfortable, convenient and cosy-looking might have seemed to many to be an utterly hopeless and impracticable task. Still I have managed it. I do not mean to say throughout any single house, but sometimes in parts and rooms of one house and sometimes in parts and rooms of another; and, if he will, the reader may easily do the same if he follow my instructions.

Workshops and workshop appliances.

20. Those who have gone thus far with me will doubtless have been enabled to gather from what I have said some idea of that which they may expect to find in the pages yet to come. I have purposely said nothing about the subjects that will be treated in Parts II. and III. for they are entirely distinct in themselves, and will speak for themselves when we come to them, as I hope and trust we may in due season. Let me repeat that it is impossible to go much into detail, with respect to workshops and workshop appliances, as many a reader, possibly, may wish and expect. All I can do, or can promise to do, in this direction is to touch on these things briefly and casually as opportunity may serve. A chapter on tools I must give, and that will be an early one; but even here, as I have already said, I cannot enter into the birth, parentage, and development of every kind of tool and the various forms in which it is or may be made. Those who are in want of this kind of thing to any considerable extent I must refer to *Every Man his Own Mechanic*, in which they are all mentioned and their uses and purposes described at length. But here I must bring my first and preliminary chapter to a close, short as it may be. I have shown, by the aid of the evolutionists, that man is essentially a tool-using animal, the only animal on God's great earth that can make use of tools; and that in this one particular point, as

Recapitulatory.

well as in others which I have not lost sight of, his superiority, his kingship, and his dominion over every other animal in this world palpably exists. I have further argued that it is desirable that every man should have a hobby to which to turn in leisure time, and that being a tool-using animal he may spend his spare time profitably in constructive work. Again I have indicated as clearly as I can what may be looked for in the following pages; and here I may conveniently close my remarks on this the preliminary part of my subject, and take up another in my next.



Elizabethan Chair in Carved Oak.

CHAPTER II.

WORKSHOPS WITHIN THE DWELLING HOUSE: THEIR FURNITURE AND FITTINGS.

Workshop, Tools, and Appliances—The Attic as a Workshop—The Cellar as a Workshop—My Cottage Workshop—The Workshops that I have had—Door on Staircase in Side Wall of House—The Workshop that grew—Things as they are and as they might be—Situation and Form of the Cellarage—Description and Arrangement of Dwelling House—The Cellarage described—The Coal Shoot—The Workshop Question—Lighting a Cellar—Lighting and Entrance as it would have been—Patent "Semi Prism" Pavement Lights—My Iron Grating over Area—Treatment of Ceiling—Alabastine—Lighting Cellar at Night-time—Precautions against Fire—The Work-Bench pure and simple—My own Bench—Its Construction—The Bench Screw—Clamp to sustain and hold Board—Receptacle for Tools—The "Drawer System"—Ready-made Drawers—Transformation of Box into Drawer—Attachment of Front of Drawers—How the Bead on Front of Drawer is made—How the Carcase of the Drawers was made—The Box-Rails and Runners—Completion of the Chest of Drawers—Trestle or Sawing-Stool—Its Dimensions and Construction—Notch in End of Trestle—Clamps, their Uses with Trestle—The General Utility of Small Chests of Drawers—Treatment of the Exterior—Treatment of the Drawers, etc.

Workshop, tools, and appliances.

21. When one king determines to go to war with another, or to resist invasion of his territory, we have it on the best authority that it is desirable for him to sit down quietly and count the cost, and consider the strength of the forces at his command, before he resolves on committing himself to the strife. And, indeed, consideration of the cost and power to act and means at our command is necessary in everything we undertake before we enter on the work in view. Even the would-be amateur wood-worker, before he attempts to begin work in downright earnest, should look up the tools he may have about him, and add to his list all those which he should, but does not, possess. The next step after getting those he lacks, in the most economical way—I shall have something more to say on this point presently—is to look about him, and find, if he can, some suitable place in which he can work and keep his tools. So before I proceed to pass over in review the tools themselves, I may as well make some remarks, as few in number and as brief as I can possibly render them, on such points as the workshop its fittings and appliances, so that nothing may be left undone on my part to help the home carpenter on his way as well and as far as I can. I cannot promise him very much on those points, because the space or number of pages at my disposal for this part of my subject are but limited, but I will do as much as I can to start him off; and after that I hope to keep him going with work without any trouble whatever.

22. The first thing that a man will naturally think of is, where he can work; or, in other words, what place he can best convert into a workshop. On this I can only give a few suggestions that may help to put him on the track, and enable him to locate himself in some place or other where he will be out of the way of other inmates of the house in which he lives, and where they will be out of his way—a mutual accommodation and convenience which is always desirable. For my own part I have never had a workshop with the dwelling-house, although at one time I was very near having one in a cellar, and had arranged matters so as to meet the end in view. Some have found, or say that they have found, a convenient retreat in an unoccupied attic; but I venture to think that those who may have been using the room or rooms immediately below, whether as bedroom or sitting-room, must have suffered at times, if not always, from the walking to and fro in the attic thus appropriated, and the noise from hammering and sawing that is inseparable from the prosecution of the craft in downright earnest. I have heard of men who worked, or who have been said to work, thus in attics; but I have never myself met with any who have done so, nor have I tried it myself. And then mark the inconvenience of lugging wood and other materials to the top of the house, and of bringing down finished work all fitted up and fastened together, and perhaps painted or stained and varnished. No, do not on any account select an attic for a workshop, if you can possibly avoid it; for the sake of the stair-carpets and the walls and the ceilings under the successive flights of stairs which will inevitably suffer injury from the corners of planks, boxes, etc., that are taken upstairs, and damages, perhaps breakages, to work that is being carried down, and, above all, the personal discomforts that will be caused occasionally to others who live in the house as well as to the amateur wood-worker himself. An attic may be all very well for those who do nothing else but fret-cutting or wood carving; but for such work as I am accustomed to do myself, and wish to induce others to do, it is uttterly unsuitable.

The attic as a workshop.

23. Better far than any attic is a disused cellar, provided that it is dry or free from damp, and can be rendered light enough; for such a place is well out of the way on the one hand, and, on the other, entrance for materials of any length, such as boards, battens, and scantlings of any description, can generally be managed from the exterior of the dwellings without inconveniencing any one in the house in any way whatever. Especially appropriate is a cellar, if it has a window with a small area in front of it, with a grating over it; for this can be so adapted as to permit of removal, or up

The cellar as a workshop.

raising at pleasure for the admission of planks and other materials; and the light in the cellar can be increased by lighting the sides of the area with glazed tiles, and making use of suitable reflectors that will send light into the interior of the cellar. I know of one such cellar workshop, which, when it was a cellar pure and simple and nothing more, was well nigh as dark as a dungeon of the middle ages. This, however, has been converted into a workshop replete with every comfort and convenience, in which the owner keeps his benches, his lathes, his drills, his drawing table. his well-chosen library of scientific and practical works, bearing in any way on what is made or done in the workshop, with all other appliances that a man can need, including a gas engine to drive the lathes. This cellar is now lighted most efficiently by Hayward Brothers and Eckstein's Patent "Semi Prism" pavement lights, illuminators which have replaced the grated openings on the level or just above the level of the ground without, and through which openings a few feeble and scanty rays of light originally struggled. This is a suggestion well worth having, and one which should be carefully noted and borne in mind.

24. For my part I infinitely prefer some shed or outbuilding, if such can be found, or put up, on the premises, to any room within the dwelling house, whether attic or cellar. Just now I am exceptionally fortunate in this respect, for attached to the house in which I live at present is a small five-roomed cottage, which was formerly let to a labourer and his family.

My cottage workshop.

The kitchen, or living room, which is paved with brick, and which contains a fair-sized kitchen range, forms my workshop and in front of the window by which the room is lighted stands my bench, which, although it is but a rough one, is as strong as a castle, and well suited for any kind of carpentry, joinery, or cabinet making. It opens on either side of the range into a wash-house, and a small room that was used as a pantry. In the wash-house is a copper, which I can utilise for steaming purposes, and a sink which is also useful at times. On the east side—the cottage itself has a south aspect -access was obtained from the kitchen into a room which formerly served as a bedroom, but which I have converted into an excellent sudy, in which I can rest and write in peace and quietness. I may possibly tell my readers in some part of this volume what steps I took to make this attic-like room pretty and presentable in appearance. I say "attic-like" because it has a sloping roof on three sides, the walls of the cottage on which rest the wall plates that carry the rafters being no more than seven feet in length. On the north side of my study, but in no way connected with it, is a small room that was evidently added to the cottage after it was built, which serves as a store room for a variety of articles and material which I am constantly requiring in my practical work.

25. I have said that this book will consist to a great extent of descriptions of various kinds of work that has been done, and of different kinds of buildings and appliances that have been constructed by myself or under my directions. I have said also, that the workshop or place which I now use as a workshop is nothing more than the kitchen of a labourer's ordinary cottage, which could be returned and restored to its original use and purpose in half an hour's time, by the removal of all that I have in it. So this may be dismissed without further consideration. First and last I have had a fair number, and have adapted more than one outbuilding to my purpose. The adaptations, however, were so slight, and involved but little more than the admission of light and air, that I need not refer here to the trifling alterations, structural and otherwise, that I made in them. When I first started work as an amateur I had no workshop whatever, but was obliged to content myself with a corner for my tools indoors, and work out of doors at any rough job I might take in hand, with no other appliance than a stool or short form, which served to support any wood that had to be sawn up, and for other incidental purposes. Things continued in this way for some years, until I managed to get a house with a long and darksome shed in the garden, in which I used to work at a small bench which I had contrived to make out of a packing case of inch boards. This was the first bench as well as the first workshop I ever had; and, I can assure my readers, it was a source of infinite satisfaction to me to find myself the possessor even of such small affairs as these. My next workshop was a coach-house, which, with a stable, both on the smallest possible scale, ran under two small rooms, the whole forming an annex to a semi-detached house in a southern suburb of London, where I then lived, access being gained to the rooms by a door pierced in the side wall of the house, and entered abruptly from the staircase without the intervention of a landing, in the manner shown in Fig. 7, which I append in case any reader should wish to see practically how the communication was effected. The door sill was on a level of the head of the middle stair of the three which were in front of the opening; that of the higher stair being to the height of the riser and thickness of the head above it, and that of the lower stair the same distance below it. The chief inconvenience in a coach-house workshop is, that if you are at work in it in the daytime you must have the doors open in order to light it; and this is not pleasant when it fronts the road as this did, and you and all that you are doing are fully exposed to public gaze. Then I had a shed smaller and darker than the first; and next one that I built myself in

The workshops that I have had.

Door on staircase in side wall of house.

the form of a lean-to against the side wall of a house at the bottom of the garden of the dwelling that I then tenanted; and my last one, before I became the occupant of the one I now have, may be said to have grown bit by bit. But as these were without the house any descriptions of them must be deferred till we come to the second part of this volume, when I will give a detailed account of both, and especially of the latter, tracing its growth from absolutely nothing to its ultimate completion. I have already touched on the evolution of man, and I will then go step by step through the evolution of the workshop, from the ground it stood on as the protozoon, or germ of being, to its full and final development and arrest. And this, probably, may prove more interesting to some of my readers than the former subject.

The workshop that grew.

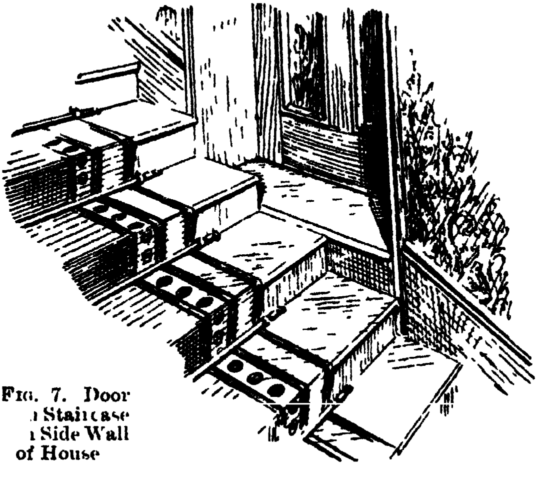


FIG. 7. Door
Staircase
Side Wall
of House

26. That I may make my remarks as useful as possible to readers in general I shall have occasionally to deal with things hypothetical as well as actual—to mention plans and schemes that I have already thought of, and may think of, as well as those which I have positively carried out. What I have done for myself in certain places and positions and in the midst of certain surroundings, may be far from suitable to the local circumstances in and under which a reader may find himself placed; so, I will sometimes describe modes of procedure hypothetically, as I have said. This is very much like drawing a bow at a venture; but, peradventure, the arrow that is shot may sometimes hit something or other that it is desirable to bring down, and which was neither in the archer's view nor yet in his thoughts when he drew the bow: and similarly I may thus be helpful to many, by supposition as well as by actual experience. I have said I was thinking of converting a cellar into a workshop; and, for the reason which I have just given, I will describe the means I was going to take to make it suitable for my purpose. It will be borne in mind by my readers that I

Things as they are and as they might be.

am now dealing with workshops *within* the dwelling-house. Attics, as I have said, are too much out of the way, and suitable only for wood carving, fret cutting, and any very light work, in the way of making such articles as cases for paper and envelopes, and other minor bits of cabinet making; disused rooms in the body of the house are only fit for the same purposes; and cellars or rooms in the basement alone remain, making it almost a matter of Hobson's choice. Further, in town houses, with little or no garden, the cellar or one of the cellars, if the cellarage be extensive, may be decidedly appropriate; and therefore it is all the more desirable to describe what I had thought of doing, had not something occurred to change my purpose. And this, in reality, was the growth of the workshop that grew.

Situation and form of the cellarage.

27. In the house which I have now in my remembrance the entire ground floor to the depth of four feet was undermined with cellarage; yet for all this the house was damp in parts. Surveyors were not as active and energetic as they are now, and architects and clerks of the works were not so particular; and the outcome of this laxity and the evident desire of the builder to do the work in as perfunctory a manner as possible, or, in other and plainer terms, to "scamp" it, had led to the total omission of the necessary dampcourse. For the better comprehension of the cellarage and the general arrangement of the house I have thought it better to give in Fig. 8 a block plan of the ground floor, especially as I shall have to refer to it hereafter in various parts of this volume. It is drawn on a very small scale, namely, one-sixteenth of an inch to a foot, and so it does not take up much room considering its importance, and the size of the area that it represents. The house itself was built of yellow brick, with red brick quoins and dressings. As I have just said, it was not what one could have called a well-built house, and it was certainly not a house that was finished. It was left in the rough in many parts; people had lived in it in the rough since its completion by the builder, so far as completion was understood by him; and it was in the rough I found it when I entered on my occupancy. One day I happened to meet Walplate, a local builder, who observed, evidently in pleased remembrance that a portion of the family mantle had fallen on his shoulders, "Ah, 'Poor Old Uncle' built that house in which you are living." "Yes," I rejoined somewhat sharply; "and I only wish 'Poor Old Uncle' had built it better, and not left so much for me to finish in it." This shot between wind and water seemed to take away his breath for a few moments; but when he recovered power of articulation, he blankly replied, "H-m-m, I dare say you do;" and promptly went on his way, evidently remembering the sins of the

fathers, and perhaps some of his own too. But "It's a way they have in the building trade, which nobody can deny!"

Description and arrangement of dwelling-house.

28. But let us turn to the block plan of the house, every part of which for "auld lang syne" and very much that happened therein, is indelibly fixed on my memory; so much so, indeed, that from mere recollection Fig. 8 has been produced, and exactly to scale. It was a double-fronted house, with square bays, and the space from bay to bay was roofed with zinc, and partly enclosed with fancy trellis-work. From this access was obtained through the front door to a small entrance hall, 6 feet in width, and A in plan, with a dining-room 16 feet 9 inches by 11 feet 6 inches on the left as you entered; a small drawing-room, C, or room which was used as such, for by its fittings the room on the first floor over B was evidently intended to fulfil this function, and a kitchen, D, the drawing-room and kitchen both being 13 feet by 11 feet 6 inches. The measurements are exclusive of the bays. There was a small back kitchen, E, entered from the kitchen and entering on the garden, which was also entered by a door under the semi-landing shown in the plan. Opposite the staircase was a small pantry, F, which once had served another purpose, but had been converted to its present use by myself, an additional bit of brick and mortar having been annexed to the original building, to serve F's previous purpose. The space, H, without the house and lying between the house and garden wall, indicates the site of the workshop, which was created by evolution. The double dotted line *a b* across the hall is placed there merely for convenience sake, to show the position of a dwarf wall in the cellarage, to which I shall have occasion to refer presently. Some may think that in giving this description and plan of a particular house, which really exists in Lord-knows-what Street, Blanksend, a parliamentary and municipal borough, and river-port of considerable importance in Gardenshire, I have been wasting time and space; but I can assure them that in pages yet to come they will recognise

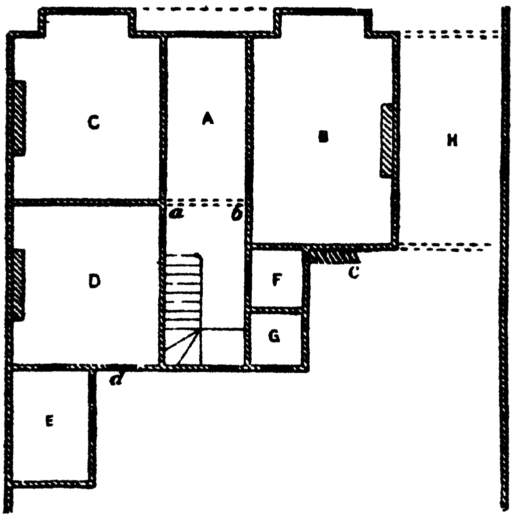


FIG. 8. Block Plan of House

its relevance, and see that it would have made much that I have to say difficult to understand had I dispensed with either. I am not the man to do anything in this respect without a settled purpose. On this, to use a colloquial yankeeism, "you may bet your boots."

The cellarage described.

29. Under the kitchen, D was the special cellar which I had intended to convert into my workshop. It was the only true cellar of full depth or height in the house when I entered into occupancy; and it was entered not by a door but by an opening in the wall, between the foot of a short and steep flight of steps under the staircase shown in Fig. 8, and the dwarf wall indicated by *a b*. The opening corresponded in position to the door on the ground floor that gave access to the kitchen. The lobby, -if I may use a word so imposing and so intimately connected with the "in-and-out" parliamentary history of the spring and summer Session of 1893, --was of the same height, or very nearly so, enabling one to walk in an erect position into the cellar under D, to a wooden meat safe with zinc wire doors that was planted on the dwarf wall at *a b*, and masked the space beyond it; and to a nice cool wine cellar under the space shown as winders and semi-landing of the staircase in Fig. 8, which was used—I am sure Sir Wilfrid Lawson and Co. will be glad to hear it —not for the purpose for which it was originally intended, but by a dear son of mine as a dark room for the development of his negatives and other purposes connected with photography. Under C, A and B, there was what I may call pseudo-cellarage only four feet in depth from floor above to surface of ground below. Of these C was entered from D by a hole knocked through the pantry wall. Entrance to A and B - I mean the cellarage under these rooms and not the rooms themselves—by similar means, while another hole between the dwarf wall *a b* and the part lettered F, brought you once more into the lobby. The perambulation had to be effected in a crouching posture, and with considerable detriment to elbows of coat and knees of trousers; and the first time I went on circuit by the aid of such light as I could throw on the subject by striking a lucifer match from time to time, I must confess that I looked from corner to corner with no little apprehension that I might see, after the manner described in a now well-nigh forgotten song, "a dollop of bones lay grizzling there, and the leg of the breeches he used to wear". To my relief, however, no one had been guilty of anything approaching to homicide; and nothing but brickbats, bottles, some sound and others smashed, with stray bits of wood, rags, pieces of carpet, worn-out mats and tin cans were perceptible; and these I promptly served with a notice of ejectment for cleanliness' sake.

30. Under D was, as I have said, the coal cellar proper, which it was impossible to close when coals were shot in, because the opening from the lobby was utterly devoid of a door, so the coal-dust had free means of access to the meat-safe and the parts about it. And more than this, "Poor Old Uncle" in a fit of temporary insanity let us hope, or with the laudable intention of rendering a general wash and brush up all through and throughout kitchen and scullery unavoidable whenever coals were brought in, had made the coal shoot and located the circular plate that covered the entrance to it just in the corner of the scullery E, as the diagram stands to the left, and just between the kitchen or rather scullery door and the innermost angle. This plate I had to move and place outside just in front of the kitchen window, and allow the coals to go down a shallow and very steep incline also under the window, with a grating on the limited liability principle through which a few rays of light managed to struggle, filling the place with a very dim, anything but religious, light, which just served to render visible the darkness which was intensified by the absence of limewash and the presence of coal-dust and cobwebs, that in all probability had been accumulating for twenty years.

The coal shoot.

31. Being shopless, I turned it over and over again in my mind, whether or not I should make the coal cellar my workshop; but if I did so, the question arose, where were the coals to go? At first I thought I would deepen the cellarage under the drawing-room, taking out a pit in the centre, and leaving a bank about two feet in width all round, which I would face with a containing wall of brick, and effect a proper entrance to it by extending the small opening that has been already mentioned, to the dimensions of a doorway. But the excavation that was necessary, its carrying out in baskets on men's shoulders through the garden to the street, and building the containing wall, making the hole a doorway, and putting up a door and its framing, would have rendered this a costly business; so I determined on leaving the cellar to its original purpose. If I am asked why I did not make the space under B my workshop, I must explain that it was owing to the difficulty of getting light sufficient to enable me to work therein; for in front of the French window through which entry to the garden was obtained from the dining-room, lay a large paving stone, and this I should have had to remove in order to form an area sufficiently large for lighting purposes. Then I could have had no bank at that end of the cellar, but should have had to extend the excavation to the wall itself, underpinning the wall so that I might be enabled to get a bench close up to the wall, and

The workshop question.

directly under the window, so that I might be able to see what I was about when at work. Moreover, it was some time then since I had entered on the occupancy of the house, and the workshop at H, which was in process of evolution, had begun to grow.

32. Well, now, for the benefit and information of those who have a darksome and dungeon-like cellar inside a dwelling house that they wish to convert into a workshop, let me say what I should have done in my case had I determined on entering on the work of conversion, and the means of putting in materials from without. Fig. 9 shows the style, appearance, and extent of the opening by which the cellar was lighted, in elevation, section, and plan. The wall of the house was carried on a flat arch, as I have shown at A; the width of the opening between the line of the wall of the house may be gathered by that which intervenes between the dotted line and the cemented ground outside the kitchen and back-kitchen, shown in plan at B; and again in section at C. To say the most of it, there was none too much of it; and when I transferred the slab of stone with the circular iron plate in it from the corner of the scullery where "Poor Old Uncle" had placed it to the front of the opening, I had to knock away the cement in B, and enlarge the hole in the ground below, and, as shown in C, paving it with brick, so that the coals might go down readily into the cellar. This, however, will need no explanatory diagram. Before this was done, we had to have the coals carried down the cellar in self-defence to avoid dust and smother; and even when it was done my people always used to complain of the mess that was made when coals were brought in. I have often wondered to what extent they might have gone in forcible and denunciatory language if the coals had been shot in the corner of the scullery in accordance with "Poor Old Uncle's" manifest intention.

Lighting a cellar.

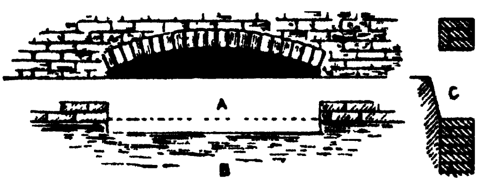


FIG. 9. Opening into Cellar at *d*, below window to D in Fig. 8. A, Elevation. B, Plan. C, Section.

33. The means that I should have adopted for securing sufficient lighting, entrance for materials, and ventilation may now be described. Referring to the illustration in Fig. 9, and especially to the plan at B, I should have cleared and excavated an opening in the cemented walk about 3 feet in length and 2 feet in width; and this I should have bricked up with an inward slant, so as to form a space about 18 inches wide at the bottom; after having made suitable provision to carry off all rain water that

Lighting and entrance as it would have been.

might fall therein to a deep rain-water tank at no great distance in the garden, from which water was obtained by means of a pump in the scullery. I should have covered the brickwork with white glazed tiles, for the sake of increasing light in the cellar by reflection; and I should have covered the opening by a grating set in an iron frame supported on the brickwork with which the new area would have been lined, and hinged to it so as to be lifted at pleasure, and fastened by a chain, staple and padlock accessible from within, or other suitable means that would doubtless have occurred to me. Then I should have placed a good casement window in the wall, with both valves opening outwards, and about 2 feet 9 inches square, or more if space would have permitted. Thus I could have got in anything I wanted in the way of boarding, battens and scantlings; and if I had taken in hand any piece of work too large to be put out through the window or carried up the cellar stairs, I could have taken it outside piece by piece and fitted the parts together afterwards. I have omitted to say that I should have made the central upright of the window frame against which the valves closed, movable, so as to extend the window opening to the utmost. This is done by rebating the top and bottom of the bar, so as to slip into notches cut in the frame to receive them, and securing it in its place either by screws, flush bolts, or a plate over all inside at top and bottom. The bar should be made as light as possible, so as to obstruct the light as little as may be; and if it be of iron and the casement valves of iron too, so as to combine the greatest possible strength with the least possible bulk, so much the better. I should have placed a reflection of some kind overhead, so as to throw light reflected from the tiles that would have lined the area downward on the bench, which would have been placed in front of the window.

Patent "Semi-Prism" Pavement Lights.

34. And here it may possibly be laid to my charge that I have not been sufficiently explicit, and why I have not at once recommended converters of cellars into workshops to use Hayward Brothers and Eckstein's Patent "Semi-Prism" Pavement Lights, which I have mentioned in a previous section – in short, why I did not make up my mind to use them myself, had I ultimately decided on adapting my cellar for the purpose I had in view. I will tell you. Horace, who got his tip from an old Greek proverb, has told us,—

> "*Non cuivis homini contingit adire Corinthum,*"

which will be all the better understood—by country cousins at all events,—if I render it freely in the following words, making a slight alteration with regard to place: "It *is* not in the power of every man to have his fling in London."*

Trips to Corinth as the ancients knew, and trips to London as we moderns know, cost a pretty penny; and as poor amateur workmen know, such luxuries as Patent "Semi Prism" Pavement Lights cost money too; and it is not within the power of every man who would like to have them to purchase them. I certainly could not have afforded them myself,—literature has never paid me well enough for this.

My iron grating over area.

35. "Well then," another poor amateur may urge, "you may as well tell us how you intended to manage the iron grating over the area; for you have not been explicit on this point." I must own that I have not, and I will at once do my best to rectify the omission. I should have looked about me in builders' yards and marine stores for a large iron grating—large enough at all events to suit my purpose, and this grating I should have had cut into two equal parts by taking out a piece on each side between two adjacent bars as shown by the shaded part at A. I should then have had a frame of angle-iron mitred at the corners, as shown at B, to lay on the top of the brickwork of the area, and to be set thereon in cement: and I should have had my pieces or valves of iron grating riveted loosely to the angle-iron frame as shown at C, the end of the grating being rounded to admit of free motion about the rivet, and removed somewhat forward from the angle of the frame, so as to lay well back when open. Lastly, I should have had loops, as shown at D, welded, after the fashion of staples, to the bars that met in the centre when the grating was closed, to carry a padlock.

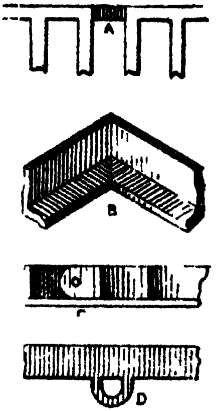


FIG. 10. Treatment of Grating.

Treatment of ceiling.

36. There was no ceiling to the cellar, the under surface of the kitchen floor and the joists on which it was laid being exposed to view, thus rendering the kitchen itself cold and draughty in windy weather, as it certainly would have been had I not covered the floor with linoleum. Had I made the cellar my workshop, I should have put up a ceiling of match boarding, painted white, or, which has the same result and which is infinitely cheaper and more quickly applied than paint, coated with alabastine. This admirable pigment, if I may call it so, can be used both on wood and plaster, and when used on plaster it does not require washing over, as in the case of whitewash or limewash, to remove the old coat before the new coat is applied. It is mixed simply with boiling water, and requires no size; it may be used in the thinnest possible wash, or thickened to the consistency of thick paste or gruel, in which form it may be put on walls or woodwork, and worked into

patterns by means of a grainer's comb, or other simple appliances. Thus embossing the surface in low relief, and diversifying the surface in a most pleasing and attractive manner with furrows and ridges that produce a beautiful effect of light and shadow. If there be a ceiling to the cellar which the amateur artisan intends to convert into a workshop, all that he has to do is to wash off the whitewash and colour or whiten it with alabastine. My advice to the amateur, and the professional workman too, is to avoid whitewash as carefully as Satan is said to keep clear of holy water. One cannot speak too strongly on such points as these.

Alabastine.

37. With regard to lighting the cellar at night-time there is not much to be said. Amateur workmen who are electricians will doubtless resort to the electric light. Dwellers in towns who can avail themselves of gas will adopt this as a means of lighting and warming too; and those who are not electricians and cannot get gas must content themselves with petroleum lamps, provided with good reflectors to throw as strong a light as possible on the work in hand; and to this end, the position of lamps of any kind should be over the bench, or on the wall in front of which the bench stands, for obvious reasons. All lights should be bracket lights, capable of motion over the bench to as great an extent as possible; and if the ceiling be low, and made of match boarding especially, precautions must be taken to guard against any contingency of getting it set on fire. I myself have incurred this danger more than once from petroleum lamps in passages which have been of very low pitch, as in the house in which I now happen to be living. Such risk may be obviated or reduced to a minimum by the use of table lamps, or by means of bell glasses and shields of thin sheet metal suspended from the ceiling, or even by protectors of talc such as are used over gas globes. The shifting of the lamp, especially of a bracket gas or petroleum lamp, involves the shifting of the protector; but by a simple wire arrangement attached to the bracket, the lamp may be made to carry its own protector with it. A little thought will show any amateur how this may be done; and I might really write to the "crack of doom" if I took to prescribing means and modes for carrying out every trifle of this kind. I do not recommend the use of table-lamps for work-benches, because there is some danger of upsetting them, and they are often in the way, especially when work has to be laid on the bench in order to be fitted together. A hanging lamp as far above the bench as possible, with a powerful reflector over the light, and a shield through which is passed the hook by or from which it is suspended, is probably as good as any.

Lighting cellar at night-time.

Precautions against fire.

38. I must now say something about the work-bench; and here I may observe at once that I have described many a bench of what I may term a "fancy character" in *Every Man his Own Mechanic*; and to this volume I must refer any one who is curious about matters of this kind. Twice-told tales are always tedious; and I do not care to traverse anew any ground of this kind that I have once trodden. I do not care for "*multum in parvo*" benches myself, filled with wells and drawers, and receptacles of tools of all kinds, which to me are always more of hindrances than helps,- wells especially covered in by sliding-boards in which you have to go groping about for no end of time before you get hold of the tool you want, and perhaps have to take the greater part of the contents out on the bench, before you can collar the tool you want. I have had wells in benches, but I have given them up, as being altogether a delusion and a snare. I have, O monseigneur amateur, my brother in work, a plan which seems to me far better than this; and I will presently discover to you the plan I have adopted. If you do not like it I can only say I do, because I have found it most convenient; and I am inclined to think that any one who adopts it will find it convenient too; but at present I must deal with the bench, describing my own, and referring those who want something in the fancy line to the book I have named, and to the price-lists of makers and those who deal in articles of this description.

The work-bench pure and simple.

39. The bench that I myself possess and use is devoid of beauty and anything approaching to knick-knackery, but it is amply endowed from its construction with strength and stability, which are the chief requisites in any and every bench that is intended to be of practical utility and good service to its owner. The bench itself is 6 feet 5 inches in length, 2 feet 1½ inches in breadth, and 2 feet 9¼ inches in height, and thus possesses a superficial area of more than 13½ square feet. The top is a dead level. There is no shallow trough or depression made by putting a thinner board in the centre than in front and at back, in which to deposit tools, because the level top is useful in itself for placing work on it that requires to be fitted together, such as halved work in constructing panels of Japanese trellis, etc. If I am using a number of small tools, and require something of the nature of a trough or tray in which to place them, I form it very quickly on the bench itself, by means of two slips nearly as long as the bench and 1 inch by 1 inch, with two dowels or pegs on the lower surface, which drop into holes made in the bench at the back to receive them. It is fitted with a "Perfect" Bench Stop, which is illustrated in Fig. 11. It is the best with

My own bench.

which I am acquainted. It is firm and free from vibration; it has no spring which causes it to spring up like a jack-in-the-box when the cam which holds it in place is jarred by concussion and thus gets its grip gradually weakened; and lastly, its action is quick, and is promptly operated by half a turn of the screw, shown in front of main plate of stop. Its cost is 2s. 6d. I have bench hooks and bench knife stops of various kinds, which can be easily fitted to the bench when required; but these are things which I seldom use, and I will leave any description of them until I have to draw attention to any kind of work for which they may be specially required.

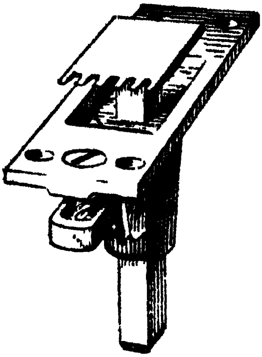


FIG. 11. "Perfect" Bench Stop.

40. With regard to its construction, the top is supported by a pair of trestles, the uprights of which are formed of timber, 4½ inches by 3 inches, so that its legs are solid and unyielding in the extreme. I have shown the front elevation at A, and the end elevation at B in Fig. 12. There is no occasion to give any plan, because it is a simple rectangle of the dimensions given above, and can be easily drawn by any amateur wood worker who may require it. The front elevation and end elevation herewith are on a scale of ⅜ inch to 1 foot. I would gladly have given them on a larger scale, but I have been constrained to restrict it to this to suit the width of our pages. The construction will be readily understood from the diagrams. The trestles are formed, as it has been said, of stout and strong uprights, and are over all 2 feet wide, and 2 feet 8 inches high, exclusive of the boards which form the top of the bench, which is made of three boards, the first of which is 6 inches wide and 2 inches thick, the second 11 inches wide and 1¼ inches thick, and the third 9 inches wide and 1¼ inches thick. Of course, it will be understood that these are the original widths, which have become slightly reduced by shooting the edges; I mention this in order to take the wind out of the sails of any precise arithmetician who might resort to addition, and under a charitable impulse write to tell me that 6 inches + 9 inches + 11 inches cannot possibly make 2 feet 1½ inches, the measure given as the width of the top of the bench. I like to save everybody else, as well as myself, as much trouble in this way as I possibly can. The top rail is recessed at the upper left-hand corner, to take the extra thickness of the first board. The top rail is 2 feet long, 4¾ inches deep, and 1⅝ inches thick, and the bottom rail the in length and thickness, but only 3⅝ inches wide. A strong brace 3

Its construction.

inches wide and 1 inch thick runs from upper left-hand corner to lower left-hand corner. This is all fully shown diagrammatically in the view given of the side elevation at B in Fig. 12. It will be noticed that the front board of the bench, which is flush with the edge of the top board in front, is dropped into the trestles, which are recessed at the top for its reception. This board is 7 inches wide. This and the legs are further connected by braces 3 inches wide, and 1⅛ inches thick, which are let into the legs to the full extent of their thickness below, and reduced in thickness at the upper end, so as to drop evenly into a slight groove made on the inner surface of the first board to receive them. The first board is 1 inch thick, and, technically speaking, the board and the brace are halved together. The board at the back is somewhat less in width than the first board, and is screwed on to the outer side of the back legs without recessment. This and the legs are connected by braces in a similar manner. A stout piece of wood is dropped in between front board and back board, and securely fastened in its place to connect the boards, and aid in making the bed for the top of the bench more stable. To this and the top rails of the trestles at each end the boards that form the top of the bench are screwed down.

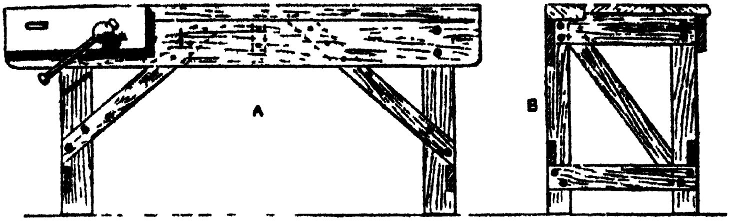


FIG. 12. A Strong and Serviceable Work Bench. A, Front elevation. B, Side elevation.

The bench screw.

41 I do not possess an instantaneous grip vice, although their holding and sustaining power renders these things desirable acquisitions. I content myself with the ordinary wooden bench screw, which is good enough for me. The board that forms the moveable cheek of the bench vice is 2 feet long, 6 inches wide, and 2 inches thick. The screw works in the usual way in a nut which is affixed to the inner part of the board that forms the front. The head of the screw through which is passed the lever by which it is actuated is about 3½ inches in diameter. The screw is a 2½-inch screw. Towards the left-hand end of the cheek is a flat runner, 2½ inches in width and 1 inch thick, which works just clear of the outer surface of the leg, or rather trestle, and is restrained from undue ingress when the screw is turned up by a peg dropped into one or other of holes bored in it with a

centre bit for its reception. It is a simple affair, but does its work very well; and that is all that is wanted. When a board or piece of wood is put into the bench vice to have its edges shot, it is usual to sustain it to the right of the bench in some part of its length by a peg thrust into one of a series of holes made in the front board. I prefer, however, to find a support for it along the entire length of the front board of the bench by a slip of wood one inch square, fitted with dowels that are inserted in holes bored in the front board for their reception. The principle is the same; but the advantage lies in continuous support being given to the lower edge of the board as far as the length of the bench extends, instead of at one or two points, as is the case when it rests on only one or two pegs. Another way is to clamp the board against the front board by the aid of a thumbscrew passing through an L-shaped piece of wood as shown in Fig. 13. The screw enters a nut let into the front board in the same manner as the nut is let into the inner side of the outer portion of a sliding casement window. The ingenuity of workmen will suggest other, and perhaps better, ways of doing this; but I have said sufficient for the purpose. Either of the plans that I have proposed to supersede the peg can be managed without much trouble, and nuts can be let in to suit boards of different widths just as holes are bored for the same purpose.

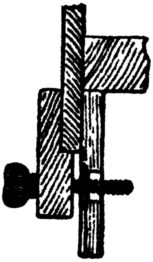


FIG. 13. Clamp to hold board against bench.

Clamp to sustain and hold board.

42. I have said that I do not care to make a bench in any way a receptacle for tools, and that I would explain how I manage to keep my own tools nicely and neatly stowed away, and yet at the same time always ready to hand and get-at-able directly any of them are wanted. Of course, to many the plan I adopt may not commend itself, on the broad principle that what is one man's meat is another man's poison. Well, it is a matter of every man to his taste, and those who do not like my plan can follow their own devices instead. Ulysses was a man who, according to Homer, had visited many cities in the course of his wanderings; and I, according to myself, have tried many ways of keeping tools in the course of my experience of many years as an amateur wood-worker. With the exception of my hand-saw and panel-saw, which are at present hanging on nails, I keep my tools in drawers and cupboard-like boxes of different sizes; but even for my saws I intend to make a box of peculiar construction, which will carry my larger saws in the upper compartment, the lower compartment being pigeon-holed to receive my various planes. There was a time when I wasted much of that most valuable commodity

Receptacles for tools.

in hunting for particular tools that I wanted, and, as a matter of course, I always pitched upon everything else before I came across the tool I wanted. As soon, however, as I began to classify tools according to the various purposes they served, a new light dawned on me; and I soon realised that the best way to arrange and keep them ready for use would be to follow classification according to purpose, as far as it was possible to do so. So, I then adopted what I may call the "drawer system," by which I soon contrived to have "a place for everything," and, as a natural consequence, "everything in its place". I do not, as a rule, leave tools lying about, unless I leave on my bench, between the dowelled slips already mentioned, some special ones that I am using to-day and am pretty sure of wanting to-morrow. Then, and only then, do I break my Medio-Persic rule of putting away any and every tool I have been using in the place assigned for its safe keeping as soon as I have done with it, so that I may put my hand on it immediately the next time I want it, without losing a moment's time in looking for it. Possibly I may derive more benefit than most amateurs would, because, owing to my acquisitive and accumulative proclivities, I have many of a sort, where they, perhaps, may have only one.

The "drawer system."

43. On hearing, or, what is much the same thing, on reading about the "drawer system," many a leisureless amateur will sigh, and say, "Oh, yes! what time have I got, I should like to know, for going in for such interminable work as making drawers?" to which I must respond, "Oh no! only wait until you know how my drawers are made, and you will find the job will not take you a tenth of the time you think it will." Different men have different ways of doing a thing. For example, an uncle of mine once asked me what I should do if I heard a noise in the house in the night and did not know what caused it. "Well," I replied, "I should go and find out." "Do you know what I do?" was his next question. "No, I don't," was my reply: "but I suppose you would do much the same thing as I should." He laughed. "Well," I continued, after a slight pause, my curiosity being somewhat roused, "what *do* you do?" "Jump out of bed, and lock the door, and jump in again!" Whereat we both laughed. This was a short way of settling the difficulty, certainly; and I can only hope that amateurs with but little leisure at command will find my way of settling the drawer difficulty as short and easy, and as much to the point and purpose, and that they also will smile when I tell them what I do in this matter.

44. I never under any circumstances trouble myself to make a drawer

Ready-made drawers.

Transformation of box into drawer

in the orthodox fashion for the use that I have specified; but I go to my grocer, and buy from him, for a very few pence, what makes an admirable substitute for a drawer under the circumstances. Most of my readers will remember having seen in grocers' establishments and stores—shops, after the American fashion, are all becoming stores, nowadays—certain boxes, bearing such legends as "Freeman's Digestive Powder," "Oakey's Wellington Knife Polish," "Colman's Mustard," and other inscriptions of this nature. Now, as these, for the convenience of packing small parcels of the commodities named, are made of certain sizes to save time in counting when they are being filled, to see that each contains its right *quantum*, it follows that if you buy half a dozen or more of any one kind of these, you have as many drawers, or substitutes for drawers, at the lowest possible cost without any trouble. These boxes all possess covers that are attached to them by wire hinges, and the first step is to remove these lids without damage to the boxes, which is easily done by lifting the wires inside the box with a small screwdriver and then drawing away the lid and the wires that are fastened to it slowly and without the application of force. The drawers thus obtained will not, I must admit, be found to be always exactly on the square; so you must overhaul them, and rectify any glaring deviation in inclination of the sides one to another, and any trifling excess in size of bottom, by withdrawing the nails and replacing front sides or back that may be found to be much out of the square and in no case in reality is any part very much out—and then nailing up again. Well, even after this they will look too much like boxes and too little like drawers to please you; but let me explain how this is to be rectified and the source from which they have been obtained completely obliterated by masking the front of the box with a thin piece of wood, as shown in Fig. 14. In this A represents the front elevation and B a section of the front piece, and the part of the box to which it is attached. The fronts of the boxes are all to be made of precisely the same size, and, when fastened to the boxes, should be put on in such a way that the bottom of the front piece, and the bottom of the box, are coincident and in the same plane, the top of the front piece being slightly above the piece of wood that forms the front of the box, as shown at B. The upper and lower edges of the front piece are finished by running a bead along them, and an iron knob is screwed into the centre of the front. The

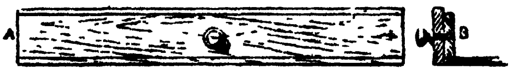


FIG. 14. Appearance of Front of Box-Drawer when Finished.

central point is easily ascertained by drawing diagonals from corner to corner, as shown by the dotted lines Their intersection shows the point at which the knob should be inserted. Any kind of wood, for example, wood of fair thickness used in fret-cutting, or even the pieces that formed the lids of the boxes, may be utilised to form the fronts, and suitable knobs may be found, japanned iron knobs that cost about 1s. per dozen. An easy way of turning out a set of small drawers quickly, is it not? As easy as the grandees at the court of Spain found it to make an egg stand upright after Columbus had shown them how to do it.

Attachment of front of drawers.

45. But we are not quite clear of the drawer business yet; for some will want to know how the wood frontal and the front of the box are united, and how the bead is formed, seeing that they have no plane or anything else in their possession with which to run a bead. They have, only they do not know it. This they will find out presently; for the present let us turn our attention to the method employed to put on the front. This is done without showing any means of attachment in the way of screw-heads or otherwise in the following manner. Hot glue, when the glue is of good quality and properly made, is an excellent thing in its way; but for all minor work and for jobs of this kind I always use "Waterproof Fluid Glue," which is used cold, and is supplied in handy little tin conical vessels, resembling the so-called Pyramid Oil Can. I spread this thinly on the inside face of the front piece, and after placing this and the box in fitting juxtaposition I bring them into the closest possible contact by means of a couple of japanned clamps, by which the parts are firmly held together. These I have already described and illustrated in Section 12. Of course, I take proper means to prevent any disfigurement of the front, and to distribute the pressure equally over the entire surface. This is done by putting a piece of wood about half-an-inch in thickness, and the size of the box, inside measurement, within, and another slip of the same thickness and the same width as the front of the box without. On these the pressure of the jaw and screw of the clamp are brought to bear, and the whole is left in this position and condition until the glue is perfectly set. Look at the marks made by the pressure on these pieces of wood, and you will at once realise what kind of appearance the front of your drawer would have presented had you neglected this precaution. The gluing should be done as a matter of course before the front piece is attached, but the central point of the front piece is more easily determined before the gluing up is done.

46. Now for the beading. Every amateur has some screws in his pos-

session, and for running the beads on top and bottom of the front nothing more is needed than a common wood screw, many sizes of which every amateur surely has in his possession. In this we see how results that are usually produced by planes that cost a good deal of money may be obtained by the use of comparatively simple means. Beads, generally speaking, may be made by the agency of screws of different sizes: but the labour involved, except in small beading, such as I am now describing, is something considerable. I have never tried it, but I daresay reeding, or the running of parallel beads close together, may be managed by the same means. An illustration of the simple bead router I used is shown in Fig. 15, in front elevation at A, and in end elevation or section at B It is nothing more than a little irregularly shaped piece of mahogany, about $2\frac{1}{2}$ inches long, $1\frac{3}{4}$ inches wide, and about $\frac{5}{8}$ inch thick, with a small screw set near the edge. Originally the screw was fixed in the mahogany at the place indicated by a black dot; but as the wood was thin I should have had to have placed the slips to be beaded on a piece of wood of sufficient thickness, or on the edge of the bench, before running the beads. I thought, however, that it would be less trouble to move the screw than to do this, and I moved it accordingly. The edge of the head of the screw gradually cuts into the wood and forms the "quirk" or recessed channel between the bead and the plane surface of the wood. The inner rounding of the bead is effected partly by pressure and partly by wearing away the wood by the abrading action of the nick in the head of the screw, and the outer rounding is formed by running a plane along the arris or outer edge of the wood

How the bead on front of drawer is made.

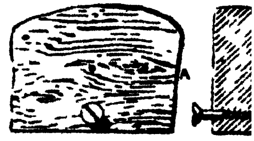


FIG 15 Simple Bead Router

47. So much for the drawers, which may be made in sets, and put in carcases of suitable dimensions. For the sake of example, and the assistance of those who may not understand the general principle on which a carcase for drawers is made, I give an illustration in part, and a description of a small set of seven that I made not long ago, as a receptacle for small tools, such as bradawls, gimlets, bits, small screwdrivers, clamps, files, wrenches, and various small tools The drawers were made in the manner described, of boxes that had contained "Freeman's Digestive Powder," and the carcase or chest into which they were filled, in the manner exhibited in Fig. 16, in which A shows the front elevation, B the side elevation of the interior, and C the plan. I have only given the front and side elevations in part, as they are sufficient to show how the carcase was made. The chest

How the carcase of the drawers was made.

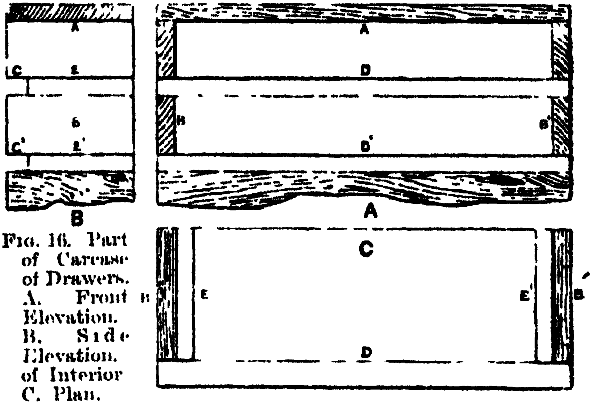


FIG. 16. Part of Carcase of Drawers. A. Front Elevation. B. Side Elevation. of Interior C. Plan.

The box.

Rails and runners

when finished contained seven drawers, and any amateur who is inclined to do so can draw the front and side elevations in full for himself. The diagrams contained in the illustration are not drawn to scale, but so as to suit the drawer front depicted in Fig. 14. In the first place four pieces of wood of suitable length and width, that is to say, suitable to the size of the drawers they were intended to receive, were cut out, squared up, and nailed together after the manner of a rough box. The wood itself was not planed up, and had been obtained by taking some other box to pieces and utilising the material. In the front elevation, and indeed in the others, the part lettered A shows the top, and B, B′, the sides. When this had been done, and the edges of the front made true throughout, the spaces for the drawers and the rails between the drawers were carefully measured out and marked, and recesses into which the ends of the rails intermediate between the top and bottom of the box were cut as shown at C, C′, in the side elevation. One of these rails is shown at D in the plan, and at D, D′, in the front elevation. Next, runners as shown at E and E′ in side elevation and plan were fixed to the sides; and the carcase for all practical purposes was complete. It is on these rails and runners that the drawers are sustained and moved in and out when necessary. Properly, the spaces at C, C′, in the side elevation should have been filled in at the outer edge of the drawing and shaded to show the section of the rails; but I have drawn and left them as they are to show how the notches for the reception of the end of the rails were cut.

Completion of the chest of drawers.

48. Of course I did not leave the carcase in this unfinished state, because it would have presented a very unsatisfactory appearance if left thus in the rough; so I will describe how I completed it. I do not give an illustration in full, as it is really not necessary. In the first place, I blocked the bottom and put on a plinth, as shown in Fig. 17 at A. The plinth was merely a thick piece of wood with the upper edge bevelled. It was returned round the sides and mitred at the edges. On the top I screwed

a piece of board as shown at B, having first rounded the arrises of the upper and lower surface with a plane. Before these pieces were added to the drawers, I had nailed to the edge of the sides two slips of wood of the width of the sides, and beaded on the *inside* edge, as shown at C; and when this was done, I covered the rough sides with very thin boarding, of the thickness of the width of the bead, rounding the edges with a plane before it was put on. This part of the work, I should say, was done before the top and plinth were fixed, due provision having been made for the fixing as regards measurement and fitting into place before the sides were fixed. Moreover, the sides extended to the bottom of the blocking, and were covered by the plinth. The beading at the edge or rather on the edge or front of the sides stopped at the plinth and rested on it, and the front of the thin side covering was suitably notched at the lowermost part of its edge to receive the plinth. Thus I finished my chest of drawers for small tools. The rest of my tools, saws, planes, and other large and weighty appliances excepted, are located and disposed of in box-drawers in the same primitive but useful way. I must not omit to say that I put a back to the carcase.

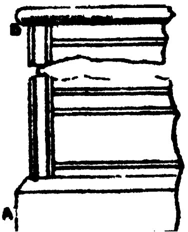


FIG. 17. Completion of Drawers at Top, Bottom and Sides.

49. I have spoken now at length of workshops within the dwelling-house, of the bench, and of receptacles for tools, or, at all events, those which I use myself and which commend themselves to me as being most handy and convenient. There remains only the trestle, or sawing stool, which needs description. If I refer readers to a description which I have already given in *Every Man his Own Mechanic* those who do not possess that volume will be properly vexed with me for having done so; therefore, in this case I will quote myself. I may as well do this as give a new version of the old text; for having looked through it I don't see any way in which I can improve on what I have already written, merely premising that every amateur artisan should make and keep two of these for his own use; for he will often find it desirable, and even necessary, to have a pair of them on which he may set a long piece of quartering when he is cutting mortises in it, or a long board that he is ripping down with rip or handsaw. Further they are useful as supports for boards when doing a little in the way of paper-hanging, or for work which is being fitted together and for which there is no room on the bench.

Trestle, or sawing-stool.

50. "In Fig. 18, a trestle, or sawing-stool, is represented in section or in elevation at either end, being the mode of representation best adapted for

Its dimensions and construction.

Notch in end of trestle.

showing its construction. A is a piece of wood about 2 feet or 2 feet 6 inches long, 4 inches wide and 3 inches thick; and B and C are two pieces of wood, about 2½ inches by 2 inches, or a little stouter, if it be thought necessary. A notch is cut in the upper part of each leg, as at D E F, so that when the legs are placed in the position shown in the drawing, the sides and bottom of the piece A may rest in the notch thus formed, the sides of the notch being at right angles with each other. The notch may be made deeper, as at G H F, to afford a better bed or resting place for the block A, or the sides of the block may be slightly grooved, so that the part G H E D, of the leg may be let into the body of the block. When four legs of this description have been cut out, and the block grooved, if it be thought better to do so, for the reception of part of the notched ends as described, they must be nailed firmly to the block, two at either end, opposite to one another. To give stability to the trestle a piece of inch board, of the shape K L M N, is nailed to the legs on the outside, and two strips lengthwise from leg to leg, as shown at N and O. The appearance of one of the at the side is shown in Fig. 19, in which A is the block that forms the top as before, C the leg, N M the end showing grain of the piece of wood K L M N, and O the slip nailed from leg to leg on the same side. A stool or trestle thus made is very strong, and will bear plenty of heavy blows and hard usage without being damaged beyond the injury that such knocking about may inflict on the surface. The end of A is often cut, as at D E F, in Fig. 20, the angle D E F being a right angle, or an angle a little less than a right angle. A notch of this kind forms a convenient resting-place against which to rest a piece of quartering for cutting a tenon at the end. Fig. 20 also shows a plan of the trestle at the end; A being the block, and B and C the upper ends of the legs thus lettered in Fig. 18 which are let into shallow grooves in A, as already described.

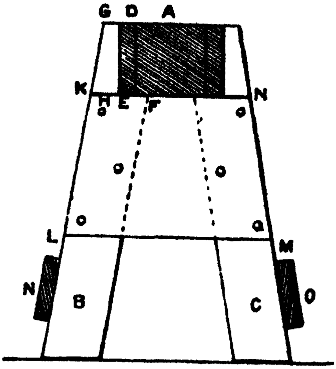


FIG. 18. End Elevation of Sawing-Stool.

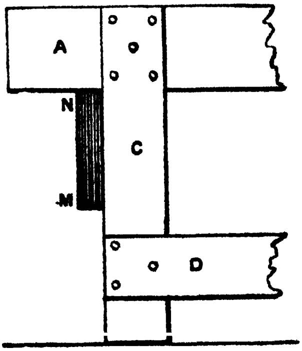


FIG. 19. Part of Side Elevation of Sawing-Stool.

Clamps, their uses with trestle.

The amateur artisan will find it useful to provide himself with a couple of clamps of the kind shown in Fig. 20, for holding down to the stool A any piece of wood that may require mortising as W." In fact, clamps of this description, as I have already shown, will be found useful in many an operation in household carpentry and joinery; but the clamps used with the trestle must of necessity be larger and stronger than those which have already been described in Section 12 as used for mending the broken chair.

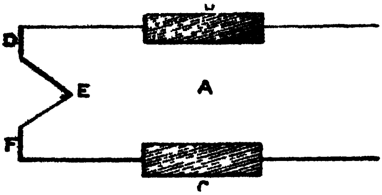


FIG. 20. Plan of End of Sawing-Stool.

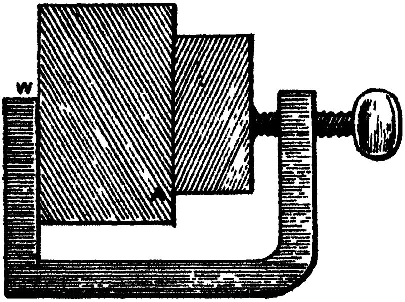


FIG. 21. Clamp holding down Wood on Sawing-Stool.

The general utility of small chests of drawers

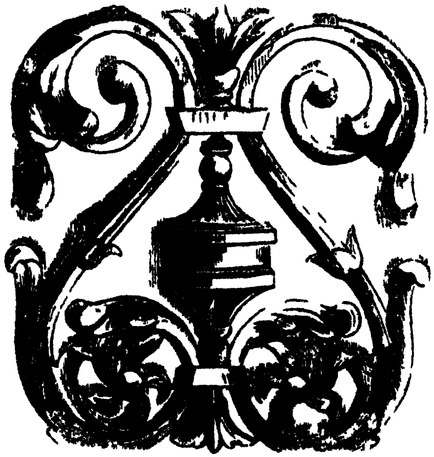
51. A word or two may be said here with regard to the general utility of small chests of drawers such as I have described above, to others who may have hobbies besides that of carpentry and who could put such repositories to other purposes than that of a resting-place, safe and secure for tools. They are useful for putting away papers, and may readily be made available for cuttings from newspapers and other sources. And what a boon they would be to collectors of butterflies, moths, shells, geological specimens and other things of the kind—specimens, in fact, of natural history and curiosities of every description that may be put away in drawers! Again, what more in keeping with the amateur wood-worker's own special hobby than the making of such a cabinet as a present to a friend or a contribution to the mass of heterogeneous things that are raked together when a bazaar is on; for all which pocket-plundering and purse-jumping-out places, to adopt the German style of phraseology, I would suggest the "Golden Fleece" as an appropriate sign and emblem, and St. Bazaarnabas as an appropriate patron saint.

Treatment of the exterior.

52. Of course, all small chests of drawers and cabinets intended to serve the purpose indicated above should have a better finish and be made of better wood and with more care than the rough repository for tools that I have described in this chapter. The kernel may be rough, if you will, but the shell must be such as the eye will approve. If made of pine, use Aspinall's Enamel as a coating; if of rough common box-board, let the top, plinths, drawer-rails, covering of sides and strips down front of sides be of mahogany or some fancy wood, worked with beads. The front of

the drawers should also be of the wood that may be selected for the parts just named. The drawers will also require special treatment: they may be papered within, if you like, and without too. For moths and butterflies, cork sheets must be used as a bottom lining, over which should be pasted a delicate cream paper, to show up those of a dark colour, and an effective grey, or deep rich brown, for white insects and those of light tints. For eggs, linings of plush or velvet should be used, the material being stretched over millboard and then dropped into place. The sides may be done in a similar way with a long strip half cut through at the angles, and pressed in over the bottom, or put in first and the bottom cut of a size to fit tightly against the sides and keep them in place, put in after. For shells, etc., the drawers may be treated in a similar manner, and if partitions are required they may be easily made of millboard and covered with paper of a tint to match the principal lining. And here endeth the second chapter'

Treatment of the drawers, etc.



Carved Scroll-Work for Panel.

CHAPTER III.

TOOLS AND APPLIANCES: THEIR USES AND ABUSES—THOSE THAT ARE ABSOLUTELY NECESSARY AND THOSE THAT ARE DESIRABLE.

Tools: Some necessary; others desirable only—Choice of Tools often difficult—Classification of Tools—Tools of Percussion and Impulse—The Hammer—The Mallet—The Adze—The Axe or Hatchet—The Screwdriver—Nail Punches—Cold Chisel—Tools of Abrasion, or Rasping Tools—Philosophy of Carpentry—Shortcomings of Modern Education—The Handsaw—How to distinguish Saws—The Tenon Saw—The Compass Saw—The Pad or Keyhole Saw—Cabinet Rasps and Files—Saw and Warding Files—Routers—How to make a Router—Tools for Paring and Incision—The Jack Plane—The Smoothing Plane—The Rebate or Rabbet Plane—The Spokeshave—The Drawing Knife—The firmer Chisel—Mortise Chisels—Firmer Gouge—Tools of Perforation, or Boring Tools—Bradawls—Gimlets—Brace—Bits—Tools for holding and grasping—Pincers—Screw Wrench—Caveat Emptor—Tools for Guidance, Direction and Definition—Carpenter's Rule—The Square—Test for Square—Marking Gauge—Compasses—Scriber—Reamer and Pencil Knife, etc.—Personal Explanation—Tool Chest for Amateurs—Dimensions—Cover or Lid—Flap Front—Space at Bottom of Box—Well—Tray—Drawer—Nail Box, Screw Box, etc.—Tools supplied with Box—Bill Hook, etc.—Switching Hook—Cross-Cut Saw, Mallet, and Wedges—Tool Basket—A Word to the Wise—The Redeemed Pledge Shops and Marine Stores.

Tools: some necessary; others desirable only.

53. IN *Every Man his Own Mechanic* I have dwelt at length on tools of all kinds, describing, as far as I could, the most noticeable, or rather noteworthy, varieties of each particular kind, classifying them according to the purpose they are intended to carry out. On reviewing the classification that I adopted there I do not see much, if any, reason to find fault with it, save and except that it is slightly capable of compression and condensation in a manner that I shall follow here. And let me say, that my aim here will be rather to show the amateur wood worker who labours for home convenience and home comfort, what tools he cannot well do without, and that are absolutely necessary, than to trouble him with accounts of a number of tools of each kind, all distinguished, perhaps, by some peculiarity which has led the adapter of the original form to invest his adaptation with the dignity of a patent;—a mode of procedure which, after all, as man is endowed with free will and has in consequence the powers of selection, may tend to his bepuzzlement by landing him in the position of Buridan's jackass, which when placed between two trusses of hay or measures of oats of equal bulk, weight, quality and fragrance, was supposed to be drawn

on either side towards each by a power of attraction so evenly and precisely balanced, that it would be for ever unable to decide to which to turn, and therefore must ultimately perish of inanition. An ass is an ass it is true, but no ass would ever advance to such a pitch of asininity as this. Yet over such points as this, and as to the number of angels that could disport themselves upon a needle's point, the schoolmen of the middle ages were accustomed to wrangle for hours. Our amateur wood worker, when considering the merits of similar tools each designed to serve the same purpose, might certainly be led to deliberate and hover between the two for a while, thinking at all events, if he did not sing it –

Choice of tools often difficult.

> "How happy could I be with either,
> Were t'other dear charmer away."

But I, for my part, wish him to be spared even such trouble as this; and so I will content myself, and him too I hope, by telling him straightly what tool of each kind I like best myself, and therefore use I will speak, in fact, positively and not comparatively.

54. Reverting to the classification of tools, which led me, as I have said, to the distribution of my tools in drawers and otherwise, according to their use and purpose, I am now disposed to arrange them thus in groups and sections: –

Classification of tools.

I. Tools of Percussion and Impulse. 1. Tools that are used for *striking* only, as Hammers and Mallets. 2. Tools that are used for *striking and cutting*, as Hatchets, Axes, Adzes, etc. Tools that are used for impulse, whether by *being turned or struck*, as Screwdrivers, Nail-punches, Cold Chisels, etc.

II. Tools of Abrasion, or Rasping Tools. 1. Saws of all kinds for cutting wood, as under 2. 2. Rasps and Files for smoothing, shaping, cutting, etc. 3. Routers.

III. Tools for Paring and Incision. –1. Planes of all kinds for smoothing, moulding, etc. 2. Spokeshaves and Drawing Knives. 3. Chisels and Gouges.

IV. Tools of Perforation, or Boring Tools. 1. Bradawls, Gimlets, and Augers. 2. Brace and Bits, sometimes called Stock and Bits.

V. Tools for Holding and Grasping. -1. Pincers, Pliers, Spanners, and Wrenches. 2. Nippers for cutting as well as grasping. 3. The Vice, including Hand Vice, Bench Vice, Clamp, etc.

VI. Tools for Guidance, Direction, and Definition.—1. Carpenter's Rule and Chalk-line. 2. Square, Bevel, Gauge, Mortising Gauge, Mitre

Box. 3. Spirit Level, Straight Edge, Plumb and Level. 4. Compasses and Callipers. 5. Scriber, Reamer or Rymer, Pencil, Knife, etc.

Thus all tools which are necessary for the amateur workman, and many which are desirable though not absolutely necessary, are brought together under notice; and the special purpose of each and the manner in which it acts is clearly defined and may be recognised at a glance. I will now make separate mention of such tool or tools for wood working that an amateur must have, distinguishing them whenever I can do so from those which it is desirable for him to have. Whenever a special tool is needed for any particular kind of work, I will leave the notice of it until I come to make mention of the work itself for which it is specially required.

Tools of percussion and impulse. the hammer.

55. First and foremost, perhaps, among the Tools of Percussion with which an amateur *must* provide himself is the tool known as the hammer. It is one of those without which he cannot possibly get on: and if he has not got one already, he must get one The hammers that I prefer myself are those of the Exeter or London pattern, as shown in the accompanying illustration in Fig. 22. The head or rather the form of head is preferable to my mind to the head of the claw hammer, which is better for gardening purposes, because the thin end of the head is curved and split, which gives it a forked or claw form, that renders it useful to gardeners for taking nails out of a garden wall. The head of the ordinary joiner's hammer of the pattern recommended is made of steel, and the handle is of ash nicely shaped. They are sold in sizes ranging from 00 to 12, and at prices varying from 8d. to 3s. 3d. A good hammer for the amateur will be found in No. 3, 4, or 5, which are supplied at 1s. 2d., 1s. 4d, and 1s 6d. Dealers will generally recommend the American Adze Eye hammer, which is a more expensive tool. No. 4 is the size I use myself, which, if I remember rightly, is a 1¼ lbs. hammer. It is desirable, but not absolutely, necessary to have a lighter hammer of the same kind for driving brads and small wire nails into small light work. This may weigh from ½ lb. to ¾ lb., and will cost 10d. or 1s. The great mistake with regard to hammers usually made by amateurs is to buy too light a hammer for general purposes. It will be noticed on watching a carpenter and joiner at work that he uses a heavy hammer for all purposes, for by long practice he can regulate the blow to the work in hand. When an amateur provides

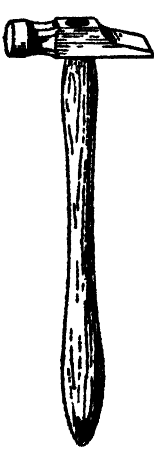


Fig 22. Ordinary Joiner's Hammer.

himself with a light hammer, he must of necessity use a great deal of power when he attempts to drive in a big nail with it; and this, coupled with its inefficiency in carpentry proper, which consists chiefly of fitting large and heavy timbers together, affords the best and most conclusive argument against buying too light a hammer.

The mallet.

56. A mallet is another tool of percussion that the amateur *must* have, for all mortising is effected by means of this tool in conjunction with a mortising chisel, and tools handled even though they be protected at the end of the handle where the blow falls, by an iron ferrule or ring, which, I am sorry to say, often injures the face of the mallet by indentations, as I have found to my cost. The carpenter's mallet is made of beech the handle being mortised into the head. They are made in sizes ranging from 5 inches to 8 inches, this referring to the measurement across the broad face of the head. A mallet with a 5-inch or 5½-inch head is large enough for the amateur wood worker, and costs, in either size 1s. 6d. Always make it a rule to buy joiners' tools, and when buying ask for them. Avoid and decline to buy polished mallets and tools with polished handles generally The polish soon gets damaged, and when this happens the tool looks infinitely worse than those with good honest unpolished handles. Never buy tools that are professedly made for "gentlemen". None of them, as far as my experience goes, are really worth having. They may seem to the uninitiated to be a better kind of thing altogether; but they are usually smaller, cheaper, and not nearly as good as tools made for the use of the professional workman. Again let me enforce and lay emphasis on the rule, without exception, that wood must be struck with wood and not with iron, and that iron must be struck with iron and not with wood. No one would think of attempting to drive a nail, or hit a punch, with anything else but a hammer. In like manner never think of striking a chisel or gouge, or a screwdriver if you are tempted to hit it at all, with a hammer, but with the tool which is intended to be used with them,— namely, the mallet. If you do, the butts of your wooden-handled tools will soon get bruised and perhaps split, and thus be rendered uncomfortable to handle and unpleasant to look at.

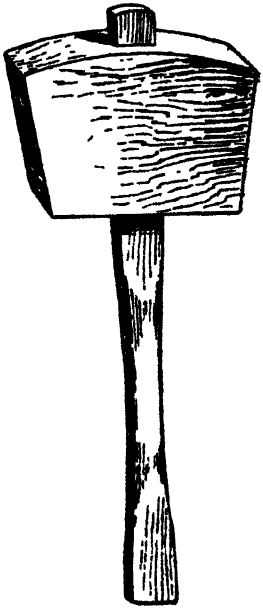


Fig. 23. Carpenter's Mallet.

The adze.

57. An adze is a tool that is in no way required by the amateur, though if there are many trees to grub up, an old adze which has been picked up for 1s. or so at the marine store dealer's, being of steel, is an excellent tool for the purpose: it is, however, very unlikely that the amateur, unless he have a somewhat extensive agricultural holding, will find much work of this kind. I have known such a tool to be used by a workman when grubbing up old roots and stumps of trees that were obtrusive and objectionable in my garden and elsewhere on my holding, and I always make a point of getting rid of them as quickly as possible. If I ever come across one I shall certainly buy it and keep it among my garden tools; for one never knows when such a tool may be wanted; and every tool, be it what it may, is bound to come useful once in seven years and perhaps oftener than this.

The axe or hatchet.

58. The axe or hatchet, however, is a tool which the amateur artisan ought to have, especially if he live in the country, or if he has occasion to do much heavy carpentry. I may indeed say that he cannot do without it, for, as an instrument or tool for striking it is used instead of a heavy hammer for framing timbers together, and also for driving stakes and pointed timber of any kind into the ground. This, of course, is done by the solid projection at the back, as may be seen from Fig. 24, which shows the form of the English hatchet, which is also known as a Kent axe. The blade is invaluable for sharpening stakes, for reducing timbers in size by chopping them roughly into the shape required, and for splitting and rending wood, the wedge-shaped character of the blade rendering it well adapted for this purpose. When buying, buy an English and not an American hatchet, such as is used in Canada and the United States for shingling. For felling trees nothing can be better than the big American axe used for this purpose: but for all minor work, such as the amateur artisan will find to do, a hatchet of the English shape will suit him best. Hatchets are sold in seven sizes, ranging from 0 to 6, and in price from 1s. 4d. to 3s. 3d. The amateur will find No. 4, which costs 2s. 4d., good enough and large enough for every purpose to which he may put it. Kent axes, specially so called, are somewhat higher in price. Best axe heads are sold at 1s. 3d. per lb. and ash handles from 6d. The heavy axe that I

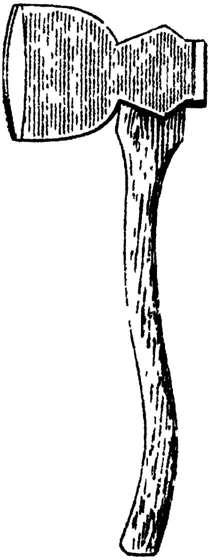


FIG. 24. Axe or Hatchet.

use for driving in stakes, etc., I picked up for 2d. at a marine store dealer's. It was the head only, I handled it for 6d.; and thus I have been enabled to keep my carpenter's hatchet bright, clean, and sharp.

The screw-driver.

59. With regard to tools that I have classified as tools of impulse or impulsion, that is to say, tools which impel or drive on being turned or struck, these are the screwdriver and the nail punch, which he must have, and the cold chisel, which he ought to have. Of screwdrivers, the amateur wood worker should possess two, if not three; and I would strongly recommend him to have three, for he will find them all very useful in their turn. Of the patterns shown in Fig. 25 I decidedly give the preference to the pattern shown at A, which is known as the "Cabinet" Screwdriver, or Turnscrew, which is the term more frequently used by dealers in tools. The "London" pattern, which is shown at B, certainly gives an idea of strength, but in reality it is not a whit stronger than those of the Cabinet pattern, which is made after the fashion of the Spindle-shaped turnscrew, known as the Engineer's pattern. The amateur must indeed have two screwdrivers, one with an 8-inch blade for heavier work and larger screws, and a 5-inch one for lighter work and smaller screws. Screws of very small size may always be driven home by the agency of a large bradawl; but it should be an old one blunted by use, that is turned to account for this purpose, and not one that is in use for boring. A 5-inch Cabinet turnscrew costs 1s. 1d., and an 8-inch one of the same pattern, 1s. 9d. Those of the London pattern are lower in price, turnscrews of corresponding length costing 9d. and 1s. 2d. It is on account of the difference in price that I give both patterns. In addition to these, I advise the purchase of a strong short blade Spindle turnscrew, which costs 10d., and is useful for short work, and for slackening or tightening or removing when necessary the screws of plane irons, etc. Never buy fancy screwdrivers that do not work, or are not worked, in the usual and legitimate way: their action will only bother you: at least, I have generally found it so. And when buying, see that the heel of the blade is firmly fixed in the slot, or notch cut for the purpose in the ferrule of the handle. Screwdrivers of the Cabinet pattern are very strong in the heel of the blade, and altogether excellent in this respect. The blades

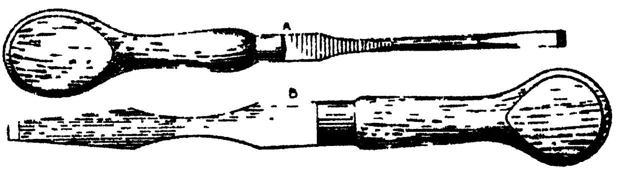


FIG. 25 Screwdrivers or Turnscrews. A. Cabinet Pattern. B. London Pattern

of turnscrews range from 3 to 14 and even 15 inches in length, and in price from 10d. to 3s. 9d. in the Cabinet pattern, and from 7d. to 2s. 6d. in the London pattern, in which by the way the blade of the longest made is only 12 inches in length. I mention this to show that if a heavy screwdriver of some length is needed at any time to actuate long and large screws it can always be obtained at no very great outlay.

Nail punches

60. Nail punches or brad punches need no illustration. They are simply pieces of steel or case-hardened iron, either square, round, or octagonal in form, about 4 inches in length, and from $\frac{1}{16}$ inch to $\frac{1}{4}$ inch in width or diameter, as the case may be, at the larger end. At the smaller end they taper to a blunt point, that is, square, oblong, or circular in form. They are used to drive the heads of nails or brads below the surface of the wood to prevent disfigurement to the work, either by their projection, or by rusting on exposure to the weather. It is better to desist driving in any nail with the hammer when the head is about $\frac{1}{16}$ inch above the surface, lest the wood should be indented or bruised with the final blows of the hammer. The nail punch is then brought into operation, and, by its intervention between the head of the nail and the hammer, the former is driven well below the surface of the wood, no further injury being caused than a depression or indentation in the wood, which is afterwards filled up with putty. Nail punches cost from 2d. to 4d. each. It is well to have two or three of different sizes to suit larger or smaller nails.

Cold chisel

61. The cold chisel is another tool which every amateur should have, especially if he be given to buy and break up grocers' boxes and packing cases for the sake of the material. Screwdrivers are too often used for this purpose, and are frequently injured or spoilt in appearance by being unduly knocked about. The cold chisel is the best thing to use for this kind of work, aided by wooden wedges which may be driven in at intervals to prise the parts asunder when an entrance has been forced by the cold chisel. It is a short iron bar, about $\frac{5}{8}$ inch square at the upper end, and terminating at the lower end in a blunt wedge-like shape, of the same width, which is of steel or suitably case-hardened. They cost from 1s. to 2s., according to length. They may be driven against any obstinate nail or screw which holds two pieces of wood together and will cut it asunder. They are indispensable if holes have to be cut in brick work or walling of any kind, either for the purpose of plugging the wall with a piece of wood to which anything may be nailed, or to cut a hole through the wall itself.

62. We have now done with tools of percussion or impulse as far as the

Tools of abrasion or rasping tools.

immediate requirements of the amateur wood worker are concerned, and may pass on to the consideration of the various Tools of Abrasion, or Rasping Tools, that he will require. I may be asked why I place saws among such tools as these, seeing that saws are supposed to be used for the purpose of cutting up larger pieces of wood into smaller pieces, or reducing them to suitable dimensions of length, breadth, and thickness. To this I will reply by asking my catechiser to consider how a saw acts. It does not make a clean cut, and is, therefore, clearly not within the category of edged tools which do not cause any *loss* of material by their action; that is to say, if you remove chips or small pieces of wood, or shavings, from the main piece with a knife, chisel or plane, and could gather up all the bits that have been cut away, and weigh them together with the piece from which they have been removed, and had weighed the wood on which you have been operating before the operation commenced, you would find that its weight has suffered no diminution. But try this with a piece of wood that has been sawn into strips and you will find that it is lighter than its original weight, and the loss in weight is equal in weight to that of the sawdust which has been separated from it, if it were possible to collect every atom of it and weigh it. Therefore, I am within bounds in saying that there is no loss of material caused by the action of an edge tool, but that there is by the action of a saw. And the loss has been caused by the action of the saw, in removing wood, that formerly lay between two contiguous pieces, in its passage between them, to the extent of the extreme width of the outer points of the teeth, or the width that exists between two planes resting against the outer points of the teeth on each side of the saw, and parallel to one another. Thus, supposing the width of the wood cut in two parts lengthwise by the saw was 2 inches, and the width of the teeth of the saw or set of the saw in the manner just explained was $\frac{1}{16}$ inch, the width of the two pieces of wood thus operated upon when put together and measured would be, theoretically, 2 inches − $\frac{1}{16}$ inch = $1\frac{15}{16}$ inch. I say *theoretically* because practically it might not be found to be this, owing to the roughness of the inner sides of the pieces that had been thus separated, and it would not be possible to bring them into such close and complete contact as it would if the sides were perfectly smooth. The wood, however, has been reduced in thickness from its original measurement to that of width of the saw kerf or saw cut, which is determinable in the manner which I have explained. This piece is now scattered over the ground in the form of sawdust. And how has the sawdust been produced? It has not been cut away, but gradually rubbed away, or in other words, by the *rasping* or *abrading* action of the teeth of the saw. Therefore, the saw is a tool of abrasion, or rasping tool.

Philosophy of carpentry.

63. Now, this is just a specimen of the "Philosophy of Carpentry" which boys should be taught in board schools and technical schools, but which they are not taught as far as my experience goes, because teachers and examiners,—from the intelligent assistant, a sort of teaching machine that a grandmotherly Government is endeavouring to turn out on the "Jack of all Trades" principle—up to H. M. Inspector, and not excepting writers and compilers of text-books, may be said to pass over without bestowing the slightest consideration upon it. They know it, doubtless; but, in the desire to be practical, and nothing else but practical, they altogether lose sight of, and so omit to explain, "the reason why," or, in other words, to show the learner the *theoretical* side of the matter as well as the *practical*. It is such teaching as this that is required to touch, vivify and expand the intellectual and reasoning power of children, whether boys or girls; and without it the teaching that it is sought to impart, owing to the style in which it is imparted will, in nine cases out of ten, be found to result in failure. Boys and girls are not to be treated as a number of vessels of equal size—quart pots, if you like to say so—into which knowledge can be poured at pleasure up to the brim, and *retained* there, even as a liquid of any kind may be poured into and retained in the pot. Memory is subject to considerable leakage, and is far from being retentive unless interest in the subject you are seeking to pour into the mind is suitably and intelligently aroused and awakened. Teaching, whether oral or otherwise, too often goes in at one ear and out at the other as the phrase goes, unless interest in what is taught is thoroughly excited. The modern teacher is far too heavily hampered and fettered with governmental forms and ceremonies to be able to do this, and his teaching power is far too often handicapped and crippled by harassing routine. He or she as the case may be would be altogether superhuman if potential to elicit interest in a subject at any and at all times in a child's mind under existing conditions. To explain as clearly as I can what I mean by rendering a subject interesting, and so bringing it all the better and more nearly within the mental grasp of boy or girl, let me say, that when at school I detested and hated Euclid, and indeed Mathematics generally, with an exceeding bitter detestation and hatred. I had so many propositions—problems or theorems—to get up at a time, and woe befell me if I did not do them. The path to comprehension was never smoothed and cleared of obstacles to progress by suitable explanation and demonstration. It was

Shortcomings of modern education.

not until I renewed my acquaintance with Euclid in the lecture room at Cambridge, that I began to realise the drift and connection of the reasoning therein, and was led, first to understand it, and then to like and appreciate it; and I may say that my experiences there gave a life and colour to my mental power which it has never lost. Explanation was the instrument that elicited comprehension, even as the hammer brings forth latent heat in the iron that it strikes with a heavy and continuous rain of successive blows.

The handsaw.

64. But to return to our consideration of tools of abrasion, and first of all the saw. Of these, the amateur wood-worker should have four, namely, a handsaw, a tenon saw, a compass saw, and a keyhole or padsaw. I will deal with them one after another in the order named, and as briefly as I can, merely premising that there is a variety of saws, of the shape and appearance of the handsaw, and that it is desirable that the amateur wood-worker should know how to distinguish them. This he may easily do by ascertaining how many teeth the saw he is looking at has to the inch. There are four kinds of saws of the form and shape shown in Fig. 26, and these four kinds are known respectively as the rip saw, the half-rip saw, the handsaw and the panel saw. In the "rip" saw, whose blade is 28 inches in length, there are 2½ or 3 teeth to the inch; and when it is said that there are 2½ teeth to the inch, it is of course meant that there are 5 teeth to 2 inches. One can never be too explicit, and I make no apology for saying this, although the meaning, as some might be inclined to put it, is "as plain as the nose on your face," that is to view and not in any way in connection with mould or make. I have no wish or intention of being personal. The "half-rip" is of the same length as the rip, namely 28 inches; but it has 3½ or 4½ teeth to the inch. The full-sized "hand" saw is 26 inches long; but it is made in various sizes, namely, 16, 18, 20, 22, and 24 inches, and the number of teeth to the inch may be 5, 5½, 6, 6½, and even 7. The "panel" saw is 24 inches in length, and has 7½, 8, 9, or 10 teeth to the inch. A good rip saw costs 6s., and so does a half-rip. A handsaw costs from 3s. 3d. to 4s. 6d. according to its length, and panel saws are the

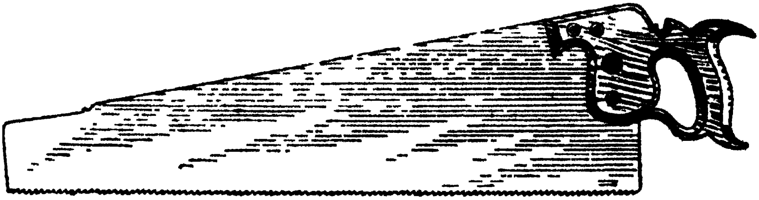


FIG. 26. The Hand-Saw.

How to distinguish saws.

same. When buying a saw get one of Disston's make. They are kept by all dealers in tools, and are thoroughly good and reliable. In saying this I must not be understood to say that others are not good and not reliable. I am merely following the course which I said I should adopt at the beginning of this chapter, and I am pointing out the description and make of tool that I prefer myself. Disston's saws are a little more expensive, but they are all worth the small amount of extra money that is asked for them. In buying a saw, endeavour to get one that is thinner in the back than along the edge, in which the teeth are cut. A 22-inch handsaw may be regarded as being large enough for the average amateur wood-worker; but I recommend any one that is going in for the work in earnest to provide himself with a full-sized saw of 26 inches in length, and I will further advise him to have one of 6 teeth to the inch. Buyers must also look to the pliability or elasticity of the saw, that is to say, the extent to which it will bend when the handle is taken in one hand and the point in the other, and both are brought as nearly together as possible. If of good steel the saw will yield easily to the tension put upon it, and spring out at once to its former condition when the tension is removed. The number of teeth to the inch can be ascertained easily by actual measurement. For purposes of this kind, I always carry in my pocket a piece of boxwood rule 3 inches in length, that I cut from the end of a broken fourfold rule. Of course, I would rather have a 1-foot four fold ivory rule about me for such purposes; but I have found the little bit of boxwood serve my need very well, and I have learnt to be always thankful for small— yes, for the smallest— mercies.

The tenon saw.

65. The tenon saw, like the handsaw, is indispensable, and is as desirable for cutting against or across the grain of wood, as the handsaw is for cutting in the direction of the grain. It is altogether different in make, shape, and kind to the handsaw; for, whereas that is pliant and elastic, this is stiff and rigid and is fitted with a back, which adds to, and indeed, causes the blade to retain its stiffness and rigidity unimpaired. The tenon saw, as its name implies, is used for cutting tenons that are to enter mortises, for which it is well adapted by its make and rigidity. It is used, in fact, for all purposes in which trueness of cut— that is to say, the cutting of a sawkerf in the lines indicated by the marking gauge or other means of defining the straightness and parallelism required in the sawing, and accuracy of fit, when parts have to be fitted together and connected by entrance and reception without departure from the guide lines that are thus marked out. The tenon saw is also used for cutting dovetails in the fitting together of

pieces of wood at right angles as the sides of a rectangular box and for mitring, that is to say, cutting mouldings of any kind, as, for example, the mouldings used in picture-frame making, and on panelled doors and similar purposes. Tenon saws are all of the shape shown in Fig. 27. The dovetail saw is made 6 inches and 8 inches in length, and is sold in both sizes at 3s. 9d. if of best quality with an iron back, and at 4s. 3d. if with a brass back. The larger tenon saws are made, 10, 12, 14, 16, and 18 inches in length, and are sold at prices ranging from 3s. 9d. to 7s. 6d. if with brass backs, and at from 3s. 3d. to 5s. 6d. if with iron backs. Disston's iron-back saws with handles of apple wood are made in four sizes, namely, 10, 12, 14 and 16 inches in length of blade, sold respectively at 5s., 5s 6d., 6s., and 7s. each. I prefer these saws myself to any other, and recommend the amateur wood-worker to provide himself with one that is 12 inches in length.

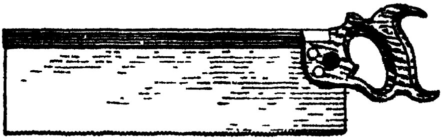


FIG. 27. The Tenon Saw.

The compass saw.

66. The compass saw is altogether different in make and form, and serves a purpose entirely different to those that are met by the handsaw and the tenon saw, as may be seen and implied from Fig. 28. If I am asked why it is called a "compass" saw, I will reply by asking, what compasses are generally used for? I shall be told without doubt that they are used for striking circles and arcs of circles. Well, then, the compass saw is used for cutting out circular work of all kinds, and round or oval holes whose boundaries have been defined or marked out by compasses. All work, in fact, that is wholly or partly curved is cut out by the agency of the compass saw, whose blade is narrow, and therefore such as may follow the curved line, however it may turn and twist. You could not cut a round or oviform hole without one. You might indeed do it roughly with chisels and centre bits, and complete the work by rubbing away the projecting pieces that would be left, and otherwise bringing it into form, by means of the rasp; but the work would not be done as neatly, quickly, and completely as with a compass saw. If it is merely sought to cut out a circular or oval disc of wood, it may be done by removing first larger and then smaller pieces of the wood with the tenon saw until a polygonal shape is obtained, whose salient angles can be removed, and the circular or oval form that is required given to it by bringing

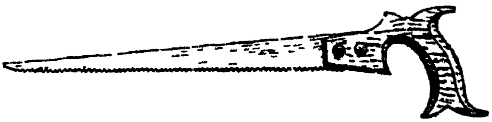


FIG. 28. The Compass Saw.

the rasp into operation. In fact, external curves may and can be produced by this means, but internal curves must or ought to be cut with a compass saw. These saws are made 10, 12, 14, 16, and 18 inches in length, supplied at 1s. 6d., 1s. 8d., 1s. 10d., 1s. 11d., and 2s., respectively. A compass saw, 12 inches or 14 inches in length, will be found to be long enough to meet all the ordinary requirements of the amateur.

The pad or keyhole saw.

67. Lastly, in the series of saws, comes the "keyhole" saw, which may be said to be a compass saw in miniature. It may be used for cutting curved lines in thin wood, but it is used mostly for the removal of wood that intervenes between two circular holes in near but not actual contiguity, produced by boring through the wood with a brace and bit, as in the case of a keyhole. It may be used, indeed, if used with care, on thick pieces of wood, but it is very apt to bend or break if the cut to be made is of considerable length, and the saw be moved rapidly. For very short lengths, as in a keyhole, in which clearance rather than cutting is necessary, the thickness of the wood is a matter of not the slightest importance. Plenty of grease or oil should be applied to compass and keyhole saws during the operation of cutting, for they heat very rapidly through the friction of the blade against the wood, and this is lessened and modified to some degree, and the blade cooled by the fat or oil with which it is smeared. The blade of the keyhole or padsaw is always independent of the handle. It is shown at A in Fig. 29, and the handle at B. The blade is secured and held tightly in the handle by the action of the two screws shown in the engraving, which exert pressure on a thin strip of iron that intervenes between the screw and the blade. The handles are perforated with a rectangular slot as wide as, or a little wider than, the widest part of the blade, and thus the blade may be shortened, and no more of it be projecting beyond the screws than the operator may think necessary, and when out of use the blade may lie within the handle, the ends of the blade projecting beyond it. Pads or handles cost 1s. 6d. each, if made of rosewood, 1s. 9d. if of boxwood, and 2s. if of ebony. The blades, which are made in two sizes, namely, 9 inches and 11 inches in length, are sold at 6d. each.

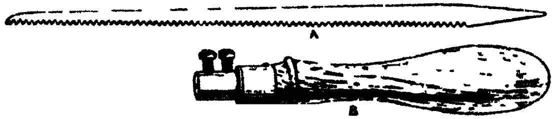


FIG. 29. The Keyhole Saw A Blade B. Pad or Handle.

68. Wood rasps are tools which will be found of the utmost use to amateurs, as they supply him with a most useful means of reducing work that has been cut perhaps somewhat full to its proper size, and of smoothing away

Cabinet rasps and files.

inequalities of surface. They are also useful in bringing two pieces of wood, held together by small wire nails inserted for the purpose, to an equality of size, and of sloping away the edge or arris of a piece of wood, if it is desired to bring it to a smaller area on one side than it is on the other, as, for example, would be a slice of wood of equal thickness throughout, cut from a cone. There is a distinction between cabinet rasps and cabinet files, or, in other words, wood rasps and wood files; but in the rasp, such as I use, one side is flat and the other more or less convex, as shown in the section at A, in Fig. 30. The blade is roughened on both sides by small projecting points, which are beaten up in regularly disposed rows from the surface, which in the first instance is smooth throughout They are made in twelve sizes, ranging in length from 3 to 14 inches, and are sold at prices according to length, proceeding upwards from 5d. for the first three sizes, to 2s. for the longest. A couple of rasps, 9 or 10 inches in length, costing 1s. for the shorter length and 1s. 2d. for the longer, will be found sufficient by the amateur for every purpose for which he may want them.

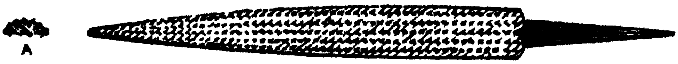


FIG. 30 Wood Rasp.

Saw and warding files.

69. With regard to other files which are sold for sharpening saws, such as saw files, and warding files which are used for cutting keys, the former are three-square, as it is termed, and, the latter are flat. Saw files are technically described as Sheffield, Paper, Single Cut and Lancashire, Blunt, Double Cut. To the uninitiated the difference will appear to be chiefly in the point or end of the file remote from the handle, which in those of Sheffield make run to a point, or very nearly so, and in those of Lancashire make possess a blank, broad, three-square end. The Sheffield files, moreover, taper in the course of their length from handle to point, while the Lancashire files preserve their width pretty nearly throughout their length. Sheffield saw files range in length from 3 inches to 8 inches, and are sold at prices proceeding upwards from 3d. to 7½d. Lancashire saw files are the same in graduation of length but their prices proceed upwards from 3½d. to 1s each. Warding files, of different shapes, range from 3 to 6 inches in length, and are sold according to length, at prices varying from 3d. to 6d. I have been particular in mentioning files of these kinds, because many amateurs will like to sharpen their own saws, and indeed should learn to do so, and some, especially those who live in the country, and are, perhaps, at some distance from a town, will take to repairing their own locks and cutting keys from blanks if needful.

Routers.

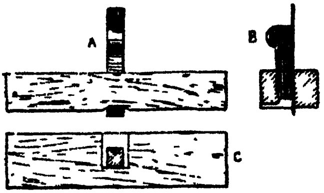


Fig. 31. Home-Made Router. A. Front Elevation. B. Section. C. Plan of Bottom.

70. Before I quit this part of my subject I must not omit to say there are a great many routers now in use, and they are applied to a variety of purposes. So numerous are they, indeed, that I will defer mention of any particular sort until I have occasion to describe any particular kind of work to which any special kind of routers may be applied. The router of which the amateur wood-worker will stand most in need is one which he may make himself, and which consists of a wood stock or box, with a hole cut in it, through which the iron or blade projects and is held in place by a taper piece of wood, after the manner of a plane A useful form is shown in Fig. 31, of which A is the elevation and B the section. The box should be made of beech, if the amateur can lay his hand on a piece, or of any kind of close hard wood that he happens to have, such as apple, or even a piece of mahogany; but beech is best suited for the purpose. The first thing to be done is to obtain a piece of iron or steel fitted for the purpose, and from ¼ inch to ½ inch in width. It must be remembered that a narrow iron may be made available for clearing away and reducing to the same level throughout the bottom of a groove wider than itself: but that a wider iron will only clear a groove of its own width or wider, or, in other words, the width of the iron is the minimum width of the groove it will clear or rout out. Having got the iron, and filed it square at the cutting end and sharpened it, the next thing is to make a box in which to set the iron. A useful width for the cutting iron is ¼ inch, and if the amateur has time he may as well make three, with iron of ¼ inch, ⅜ inch, and ½ inch in width. From 4 to 6 inches is a convenient length for the box or body of the router, which should be from 1 inch to 1½ inches wide, and from ⅝ inch to ⅞ inch in depth. The first thing to be done is to cut a square or rather rectangular hole through it, of which the back should be perpendicular and the front sloping slightly inwards, and so narrower or less in length at the bottom than it is at the top. The shape of the hole is shown in the sectional view at B, and plan of bottom at C. It should be precisely of the width of the cutting iron. A shallow groove should be taken out of the bottom in front of the cutting iron, as shown in each of the diagrammatic views of the appliance grouped together in Fig. 31. The iron is inserted perpendicularly at the back of the hole, and held in place by a wedge-shaped piece of wood or key as shown in A and B.

How to make a router.

The depth of the part of the iron that projects beyond the bottom can be regulated by removing the key, putting the iron to the requisite depth and then replacing the wedge. I use routers of this kind myself for clearing the bottoms of grooves intended to receive the ends of shelves, panels, etc. For the information of amateurs who can afford to buy and prefer to buy such tools as these, I give an illustration of a router plane consisting of an iron stock fitted with two steel bits on ploughs, one ¼ inch wide and the other ½ inch wide. It serves the same purpose as the wooden router I have been describing; but the cost is 6s. 6d., whereas the other may be made at the cost of a little time and a few pence for materials if the maker have nothing by him suitable for the purpose. There is another kind of router known by the name of "Old Woman's Tooth," the cost of which is 2s. It is held to be a plane.

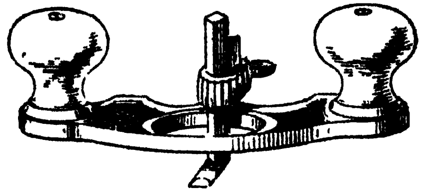


Fig. 32. Woodworker's Handy Router Plane.

Tools for paring and incision.

71. Next in our order of arrangement to the tools just dealt with come Tools for Paring and Incision. Of these, the planes which form the first section in the group, and spokeshaves and drawing knives which form the second, are tools for paring and smoothing only; but chisels and gouges are tools that are used both for paring and incision, one kind of chisel being specially known as a paring chisel. Such as these as the amateur really requires must now be dealt with in regular order.

The jack plane.

72. Of planes the amateur must certainly provide himself with two, namely a jack plane and a smoothing plane. There is a very large variety of planes serving an equally large diversity of purposes; but it is only these two that are absolutely required. If he provide himself with any other, a rebating plane will perhaps be found to be most useful. The jack plane is used for removing the rough exterior of sawn wood. Jack planes are 17 inches in length, and are provided with a plane iron 2¼ inches in width. Planes of this description, and smoothing planes also, are furnished with a double iron, that is to say, two irons which are connected by a short screw with a large head. The lower iron is set with the bevel of the

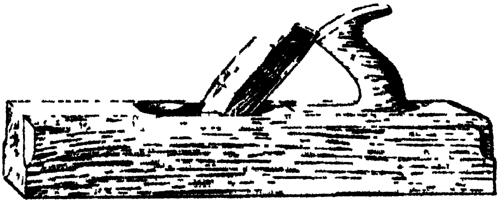


Fig. 33. The Jack Plane.

edge downwards and outwards: this is the cutting iron which removes the shavings from the wood which is being planed, and it is the iron which requires sharpening when the edge grows dull. The edge of the upper iron is bent slightly in a downward direction, and rests on the cutting iron, its edge being a little higher up than that of the cutting iron. Thus there is a space between the two irons just above the line of contact in which the higher iron touches the lower; and, this being so, the screw that connects the two has all the more power in exerting pressure and bringing the two irons together. The bevel, so to speak, of the upper iron being in an opposite direction to that of the cutting iron, acts as an inclination which meets the shaving on its entrance through the throat and turns it upward. The cost of a good jack plane is 5s.

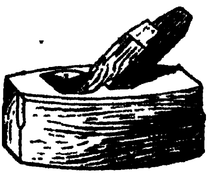


Fig. 34. The Smoothing Plane.

73. An illustration of the jack plane has been given in Fig. 33, and in using this the left hand is placed over the fore part of the plane, and the handle or toat is grasped by the right hand, and used as a means of pushing the plane in an onward direction. In Fig. 34 the smoothing plane is figured, which is used in much the same way; but the right hand grasps the stock or body of the plane, which is very short in comparison with the jack plane. It is used for making the surface of the wood perfectly smooth and even, after the rough outside has been taken off by the jack plane. The arrangement of the double iron is the same. Like the jack plane it is made in beech. It may be had with irons ranging in width from 2 inches to 2½ inches by increments of ⅛ inch, supplied respectively at 3s. 4d., 3s. 6d., 4s., 4s. 6d., and 5s. A plane with a 2¼-inch iron is sufficiently large for the amateur. Both planes should have double irons. Planes will be found to work all the more easily if the soles are smeared occasionally with linseed oil. I regard wooden planes as being preferable to iron planes; and so, I believe, do most professional carpenters and joiners, though some like a wooden plane with an iron sole on the fore part.

The smoothing plane.

74. I said that if the amateur was inclined to provide himself with a third kind of plane, he should purchase a rebate, or "rabbet" plane, as it is usually called, by a sort of clipping and compressing the Queen's English. Its form is shown in Fig. 35. It is used for taking out a rectangular recess in the edge of a strip of wood, for the reception of a panel or a sheet of glass. The "old woman's tooth" can be used for this purpose, but a genuine rabbet plane is better. The plane iron is placed across the sole of the plane at a small angle with the sides, and not at right angles to the

The rebate or rabbet plane.

sides, as in the jack plane. Thus it is that planes of this description are spoken of as "skew-mouth" planes. They are made of different widths, from ½ inch up to 1½ inches. The cost of those from ½ inch to 1 inch in width is 2s. 6d., from 1 inch to 1⅜ inch 2s. 8d., and in sizes of 1⅜ inch to 2 inch 3s. If the amateur buys one he may as well provide himself with one of the wider ones, because I may have occasion later on to speak about work that will require the use of this kind of plane, and I can then show him how to regulate the depth and width of cut by fences that he may make himself.

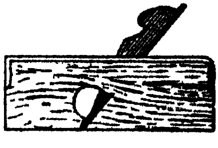


Fig. 35. The Rabbet or Rebate Plane.

The spoke-shave.

75. Further, he should have a spokeshave and a drawing knife, both of which are most useful tools in their way, although he may not require them often, especially in carpentry for the house; nevertheless, he should add them to his kit of tools. The spokeshave takes its name from being used to finish off the spokes of wheels and impart a smooth surface to them, and it is also used for giving a bevelled edge to any round or oval hole which has been cut with the compass saw. It may be used and operated either by moving the tool away from you or by drawing it towards you. It has a thick blade, slightly curved, and bevelled off to a fine edge, which should be kept sharp to be of any real service. The blade ends on either side in a tang which passes through the stock, a double-handled piece of beechwood of the shape shown in Fig. 36. When the tool is in use the shavings that are taken off by the blade pass between it and the wood, and come out through the hollow that is shown above the thick part of the blade in the upper part of the illustration. When it is necessary to sharpen the spokeshave, the blade must be removed from the handle by blows or pressure on the end of the tangs; there is, however, a better kind known as the "Registered Screw Iron Spokeshave," which has a screw adjustment by which the cutter can be adjusted to the greatest nicety by actuating the screws with a small screwdriver. The ordinary spokeshave is made in sizes of 1½, 2, 2½, 3, and 3½ inches, and is sold, according to the sizes given, at 9d., 10d., 1s., 1s. 2d., and 1s. 4d. each The adjustable spokeshaves, which are certainly better by reason of the adjustment, are made in sizes already given, with an additional size of 4 inches, and are sold, all sizes under and including 2½ inches, at 1s. 2d., and the remaining sizes at 1s. 4d., 1s. 6d., and 1s. 9d., respectively.

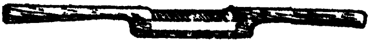


Fig. 36. The Spokeshave.

76. The form of the drawing knife is shown in Fig. 37. It serves much the

The drawing knife.

same purpose as the spokeshave, but it is used in one direction only, namely, by drawing the edge of the blade towards you, whence its name; and it can only be applied to straight work and not to circular work, as the spokeshave. The chief points of difference between the two tools are, firstly, that the blade itself is straight and not curved; secondly, that the tangs are not turned at right angles to the surface of the blade, but at right angles to the blade in a downward direction from the thick edge, and in the same plane as that in which the blade itself lies. The tangs enter wooden handles, suitably provided with ferrules or rings to strengthen them at the point of entrance. Carpenters' drawing knives are made in sizes of 8, 9, 10, 11, 12, 14 and 16 inches in length, and are sold at 1s. 9d., 1s. 10d., 2s., 2s. 2d., 2s. 6d., 3s., and 3s. 6d. each. The amateur is recommended to buy a spokeshave, with at least a 3½-inch blade, and a drawing knife with a 10 inch blade.

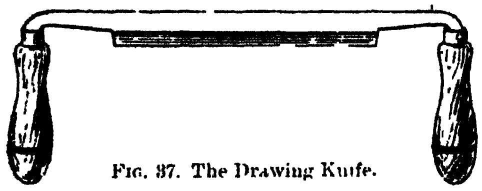


FIG. 37. The Drawing Knife.

The firmer chisel.

77. We now come to chisels and gouges. Chisels are of different kinds, but those with which the amateur wood-worker should furnish himself are firmer chisels and mortise chisels. The firmer chisel is the chisel ordinarily used by carpenters, and is the kind that will be most required. A representation of it is given in Fig. 38, and from this its form and construction will be readily understood. They are contracted in size between the blade and the shoulder which projects and butts against the handle which is surrounded at the top just below the shoulder of the blade by a strong ferrule. Firmer chisels are made in fourteen sizes, from ¼ inch width in the blade to 2 inches. Unless the amateur wood-worker wants the narrowest size for cutting holes in stocks of router bit is unnecessary for him to provide himself with any under ½ inch in width. He should then buy six assorted, as it is termed; and the sizes I would recommend to his notice are ½ inch, ⅝ inch, ¾ inch, ⅞ inch, 1 inch and 1½ inches, for he will find the broadest of the lot useful to him in the way of a paring chisel. These, when handled and set ready for use, will cost him 7½d. each for the first two sizes, and then 8d., 9d., 9½d., and 1s. 3d. respectively.

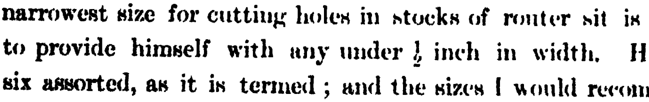


FIG. 38 Firmer Chisel

78. Examples of the various kinds of mortise chisels are given in Fig.

39. That shown at A, is the kind known as the socket mortise chisel. They are made in eight sizes, varying in size from ⅛ inch to 1½ inches, ranging in price from 1s. to 1s. 8d. He may have one of these as his broadest mortise chisel, namely, a 1-inch chisel, which will cost him 1s. 4d., or he may have the 1-inch chisel of the pattern shown at C, in which the blade contracts before reaching the shoulder, after the manner of the firmer chisel; but the blade, especially at the shoulder, and just above it, is much thicker and stronger than in its prototype. These are made in seven sizes, ranging from ½ inch to 1½ inches: and if he have one of these 1 inch in width it will cost him 1s. 6d., the prices varying from 1s. for the smallest size, to 1s. 11d for the largest. I am inclined to give my preference to the socket chisel, because the comparatively new pattern shown at C has not wood enough projecting beyond the ferrule at the lower end of the handle; and when this is beaten down the edge of the ferrule causes indentations on the face of the mallet. Still he cannot go far wrong, whichever he may purchase. For narrow mortise chisels I like the old fashioned pattern shown at B, for the blade is strongly made, and has a strong broad disc like shoulder, which butts against a very strong though coarsely fashioned wooden handle. Still the shape of the handle does not matter much so long as the blades are of good steel and the edges keen The sizes in which they are made range from ¼-inch to ⅝-inch, through seven sizes, which are supplied at prices varying from 1s. 4d. to 2s. 2d. A ⅜-inch chisel of this pattern, which costs 1s. 8d., will be found a useful tool. The prices include handles.

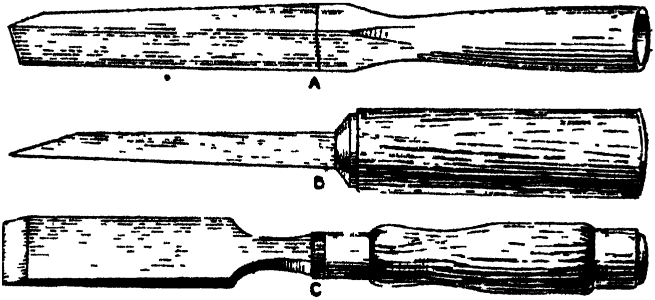


FIG 39 Mortise Chisels

Mortise chisel.

79. The form of the firmer gouge is shown in Fig. 40. It is a cutting tool, used after the manner of the chisel, and differs from it chiefly in being rounded instead of flat, and having a curved cutting edge as a matter of course, instead of a flat straight one. The amateur is cautioned to be careful to whom he entrusts his gouge when it wants grinding. I have been rash and foolish enough to allow this to be done by the "needy knife grinder" who will do any amount of pot and kettle mending for you as well, and the result

Firmer gouge.

has been the production of a rounded edge which the operator evidently thought was good form, but which wasn't. Every point of the cutting edge should be in the same plane. It will be noticed that the bevel of the chisel inclines from the upper surface to the edge which is in the lower surface. In the gouge this is reversed: it must of necessity be ground on the outside of the curve, and so the bevel inclines upwards from the lower surface to the edge which is in the upper surface. Gouges are made in thirteen different sizes, from ⅛ inch to 2 inches, and are sold at prices ranging, when handled, from 7d. to 1s. 11d., and ⅜ inch, ½ inch, and ¾ inch gouges, supplied at 7½d., 8d., and 9d., will be found to be useful sizes.

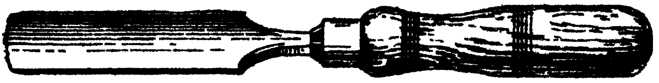


FIG. 40. Firmer Gouge

Tools of perforation or boring tools.

80. Among his Tools of Perforation or Boring Tools, the amateur must of necessity have bradawls and gimlets of various sizes. Augers he need not have, because all that he may require to do in the way of boring large holes may be done as well, or nearly as well, with a brace and bits as with augers. The brace and the bits that are used with it constitute together an appliance of considerable value and assistance, and must on no account be omitted from the amateur's outfit. I will deal first with the bradawls and gimlets, and then proceed to notice the stock, and mention one or two kinds of bits that he will find useful and indeed necessary.

Bradawls.

81. There is not a very great deal to be said about bradawls and gimlets. The chief point here is to assist the amateur wood-worker in discriminating between those which he should buy and those which he should avoid. Those to be avoided are the ordinary bradawls, of the so called London pattern, with slight brass ferrules round the small part of the handle, where it is entered by the tang, which are very likely to bend or draw from the handle if put pretty deeply into anything but the softest of wood. They are supplied with round handles at 1s. 9d. per dozen assorted sizes, or at 2s. per dozen if with oval handles. Do not buy these, but ask for and insist on having bradawls of the pattern shown in the illustration, which are supplied in assorted sizes at 2s. per dozen. These, please note, are capped where the tang enters the handle with the new patent fastening ferrules, whose construction and attachment to the handle are of such a nature that the awl

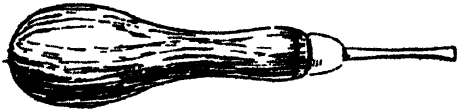


FIG. 41. Bradawl with New Patent Fastening Ferrule.

cannot possibly draw out of the handle. Break they may, and will sometimes, but the handle will never pull away from the awl and leave the latter sticking in the wood, to your great, though temporary, discomfiture, causing loss of time in securing its safe removal.

Gimlets.

82. In the way of gimlets, there is nothing better than the kind known in the trade as "twist nose" gimlets, which are also called Norwegian gimlets. These are very much of the "shell" pattern, but instead of running straight down to the conical screw point in which gimlets of this kind terminate, the blade widens towards the end, and then contracts in width and gives just half a turn before terminating in the screw point, which is slight and very taper. The illustration shows a set of six gimlets of this description, which, with a small turnscrew and a brass handle, are supplied for 2s. 6d. They are sold, I know, in the usual gimlet form, that is to say, properly handled, for they are much used by scene-shifters in theatres for pinning parts of scenes together: at least, I have been told so by a scene painter of considerable reputation, but I am not aware of the price at which they are supplied per dozen assorted in this form. Fig. 42 will be sufficient to show the shape of these; but in order to enable the amateur carpenter to discriminate between the various kinds of gimlets, and to know them by name, I give in Fig. 43 illustrations of the various kinds of gimlets in common use. Of these gimlets two kinds are supplied, assorted to ¼ inch, and at the following prices: A, Shell, 2s. 9d. per dozen; B, C, Twist, at 3s. 6d. per dozen: auger gimlets, with box heads as at B, from ¼ inch to ½ inch, are sold at from 9d. to 1s. 6d. each. But this is merely for the reader's better information. I recommend him to buy and stick to the Norwegian gimlets, on account of the facility and rapidity with which they enter the wood, and the cleanness with which they do their work.

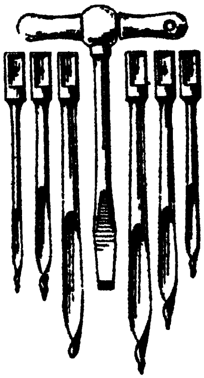


FIG. 42. Set of Norwegian Gimlets.

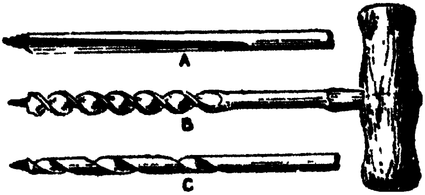


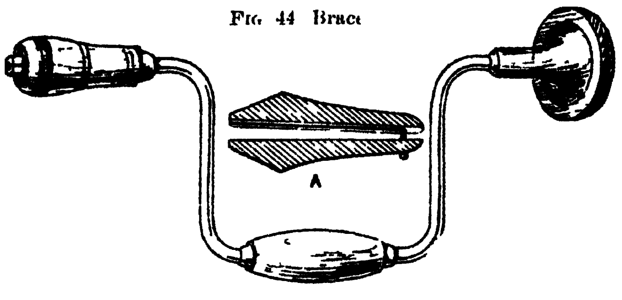
FIG. 43. Gimlets. A. Shell. B. Auger. C. Twist.

Brace.

83. Lastly, in this class of tools come the brace or stock and bits; and first let us deal with the stock. The brace shown in Fig. 44 is good enough for all practical purposes. The tube at the lower part of the brace to the left screws up and down. When screwed down it allows the

irons shown at A, which are grooved along the inner edge, to drop open ; the bit shank is then inserted between these jaws, and the boss-like tube is screwed up This causes the jaws to tighten on the shank of the bit, which is held immovably in their grip, and cannot fall out or be released until the tube is again screwed down or in an outward direction. These braces are made in sizes of 8 inches and 10 inches, and are supplied with best hardwood mounts at 5s. and 5s. 6d. I recommend the amateur to provide himself with the larger size at 5s. 6d. He can buy them for 2s. 6d. and 3s. respectively, with white wood mounts ; and if he wishes the brace to be nickel plated, he must spring 1s. on the prices already named for hardwood mounts.

FIG. 44 Brace



Bits

84. With regard to bits, a set of twenty four black bits are supplied independently of the brace for 9s. They may, of course, be purchased separately, and the purchaser may have as few or as many as he likes. The common forms of bits are shown in Fig. 45 At A is shown the centre bit, which bores round holes of equal diameter throughout. The rose bit at B is used for countersinking ; the taper bit at C for conical holes or ho'es less in diameter at the bottom than at the top ; and the shell bit at D for long and deep holes of small diameter. There is no occasion to go separately into the sizes and prices of these. I must not omit to say that a set of Norwegian or twist-nose bits for use with the brace can be had assorted from $\frac{1}{8}$ inch to $\frac{3}{8}$ inch for 1s. 3d. per set, and these the amateur should have.

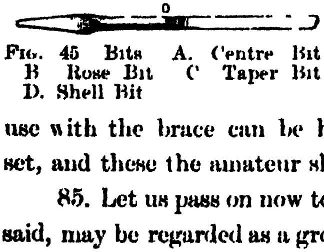


FIG. 45 Bits A. Centre Bit B Rose Bit C Taper Bit D. Shell Bit

Tools for holding and grasping.

85. Let us pass on now to Tools for Holding and Grasping, which, as I have said, may be regarded as a group divisible into three sections, namely— pincers, pliers, spanners and wrenches in one ; nippers for cutting as well as grasping in another and Vices of all kinds, including the hand and bench vices and clamps of all kinds. I need not say that among vices there is one that is known as the saw vice used for holding the saw when it is

being sharpened by the file, but that no amateur need have such an appliance as this unless he be capable of sharpening his own saws, which very few are. I will reduce the tools in this group to a minimum, and will reserve mention of any other until I may have occasion to call attention to any special work for which any other tool or appliance for holding or grasping which is not mentioned here, may be required.

Pincers.

86. The form and purpose of the pincers are well known to most amateurs, or would-be amateurs; and to those who may not be acquainted with either the illustration given in Fig. 46 will, I think, render both easy of comprehension. The two parts fashioned and fitted together as shown, and working on a pivot or rivet which holds them in sufficiently close contiguity to admit of their working freely about it, together form a powerful double lever in one way, or a simple drawing tool in the other, as will be manifest when it is considered that a nail, if not too large and too tightly wedged in the wood into which it has been driven, may be withdrawn sometimes by a direct upward or lateral pull as may be required. In this case, however, considerable force must be exerted to pull out the nail. Again, when used as a lever the nail is grasped and held in the jaws by pressure, which is increased in intensity in proportion to the pressure exerted on the parts that are held in the hand, and which therefore may be termed the handles of the tool. The jaws are then turned, either in one way or the other as may be most convenient by bringing the handles in a downward direction. The bow of the undermost jaw of the pincers is brought against the wood in which the nail is embedded, and which now becomes the fulcrum, the tenacity of the nail representing the weight, and the downward pressure of the hand which is still exerted until the weight is overcome and the nail withdrawn, the fulcrum. One handle of the pincers terminates, as shown, in a round knob, and the other in a claw, which is useful for lifting out any short nail that has a broad head or head sufficiently large to be held in the claw, by leverage. The "Tower" pincers are made in sizes of 5, 6, 6½, 7, 7½, 8 and 9 inches in length, and are sold at prices ranging from 9d. to 2s., or, to be more precise, at 9d., 10d., 1s., 1s. 1d., 1s. 4d., 1s. 6d., and 2s. per pair. The best Lancashire improved are made in sizes of 5, 6, 7 and 8 inches, and are sold at 1s. 3d., 1s. 6d., 1s. 9d., and 2s. respectively. The amateur should provide himself with pincers 7 inches in length, which will cost him 1s. 1d. or 1s. 9d., according to the kind he elects to buy. He had better take the

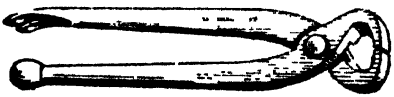


FIG 46. Pincers.

Improved Best Lancashire, which, though 8d. dearer, he will find the cheaper in the end.

87. Another tool that the amateur mechanic ought to have, and cannot well do without, is the screw wrench. It is far better than the spanner, so-called, which may be briefly described as a short bar terminating at each end in a broad plate, notched, generally hexagonally, for the reception of the nut. Thus a single spanner, of the sort known in the trade as malleable double-end spanners, will only deal properly with two sizes of nuts that will enter and fill the notches with some degree of exactness. It is true that they are cheap, for a set of four having notches of the following sizes: No. 1, ⅜ inch and ½ inch; No. 2, ⅝-inch and ¾-inch; No. 3, ⅞-inch and 1 inch, and No. 4, 1⅛ inch and 1¼ inch: is sold for 1s. 3d., but the screw wrench will deal with nuts of any size within the full measure from jaw to jaw, when brought apart as far as possible by the action of the screw; and there is the advantage of having a single tool capable of dealing with nuts of any size within its capacity, instead of four separate tools, which will only deal each with two nuts, and the whole with eight nuts only of certain sizes. The best kind of screw wrench to have is the "double bar" screw wrench, illustrated in Fig. 47. It is so called because the upper jaw, which alone is movable, and is drawn upwards or drawn downwards by the action of the screw shown in the engraving, which is set in the handle and turns freely with the handle in the socket in the lower part of the double bar piece, between the bars of which it works freely. In the single bar wrench, the upper jaw passes through the opening in the upper part of the single bar arrangement, and slides along the front bar, the bar at back being altogether removed. The back bar, however, serves to strengthen the tool, and to keep the shank of the upper jaw perfectly within bounds and preserve it from injury. It also counteracts any tendency to shift, if shifting were possible. Wrenches of this description are made in sizes of 8, 9, 10, 12 and 14 inches, these being applicable to the length of the tool itself when closed. Single bar wrenches are sold at 2s. 6d., 3s., 3s. 6d., 4s. 6d., and 5s. 6d., according to size. Double bar wrenches at 4s. 6d., 5s., 5s. 6d., 6s. 6d., and 8s. 6d., respectively. If the amateur has a double bar eighth wrench at 4s. 6d., it will serve his purpose well.

Screw wrench.

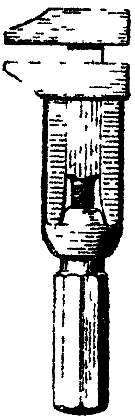


Fig. 47. Screw Wrench

88. And here let me ask the amateur who is about to buy to take notice of

Caveat emptor.

the forms of tools as per illustrations; and when buying let him insist on having tools of the form exhibited in each case, and decline to purchase any other. Let him also decline to purchase unless the prices correspond with those which I have stated in each case. Not long ago I myself wanted a screw wrench, and having found an ironmonger's, went in and stated what I wanted. The gentleman who bossed the show produced two, which, he said, was all he had in stock, which made me think his stock was in much the same condition as the salt sea at spring tides at lowest ebb just before the return of the water; and I could only hope that his stock would soon be on the rise again, and so afford his customers, whether chance or regular, a better opportunity of selection. One was a small wrench, very ricketty in action, and that made one doubtful of the power of its jaws to remain in place, even after fixing by the means supplied. The other was a 12-inch wrench, of the kind known as American wood handled wrenches, which are supplied under two conditions of finish, namely, as "common black" and "best bright". The wrench in question was a "common black" wrench, which is ordinarily sold at 2s., the "best bright" commanding double this amount. I took it up and examined it and asked the price. The retailer promptly replied 6s. 6d.; whereupon I laid it down, expressed my regret and sorrow at having caused him the trouble of untying the parcel fruitlessly and of tying it up again at his leisure, and retired meditating and moralising on the manner in which this exemplary man conscientiously did his best and utmost to keep that commandment of sale, barter, and exchange— the first, I believe, of the code to which it belongs which finds expression in a duplex form, namely, "Have, or you'll be had:" "Do, or you'll be done brown." My excellent dealer in hardware evidently did not mean to be "had" or "done brown" either, if he could help it, and so as in duty bound, sought clearly either to have or to do me. But he hadn't, and didn't. I have labelled this section *Caveat emptor*, a form of expression which I believe is well and widely understood, as a caution to purchasers to be at all times and in all seasons "on their guard." After all I have said on this subject they will only have themselves to thank if they are caught napping.

89. And now we come to what was styled in the United States of America when at loggerheads in the great War of Secession, the "last ditch," which in this case implies the last group of tools included in our classification of them. In this ditch I will keep the reader for as short a time as possible. In the group named in the margin I have said that there were five sections, the first of which comprised the carpenter's rule and chalk line: the second,

Tools for guidance, direction and definition.

the square, bevel, gauges, mortise gauges and mitre box; the third, the spirit level, the straight edge and the plumb and level; the fourth, compasses and callipers: and the fifth, the scriber, the reamer or rymer, pencil, and knife: of these he will certainly require eight, but I will endeavour to show how some of the eight may be made to do the work of two or more tools.

Carpenter's rule.

90. An illustration of the ordinary carpenter's rule is shown in Fig. 48. Of these it may be said that "there are, and there are," for there is a great variety of them in the tool market. As the illustration is so extremely clear there is no need of much description. The rule shown in Fig. 48 is a representation of a rule with an arch joint and bevelled edges, and is sold at various prices, according to quality and finish. Common rules of this description are sold at 6d., 8d., and 10d. each, and the better kinds at 1s., 1s. 6d., 2s., and 3s. each; but it should be explained the better kinds have the arch joint, and the inferior kinds have not. Consisting, as they do, of two strips of boxwood, graduated by marginal division into 8ths, 10ths, 12ths, 16ths, and even 32nds of inches in the better kinds, connected as shown by the arch joint, and working on a pivot put through its centre, or rather the common centre of the plates that form the actual joint which are circular as shown, and are passed between one another these rules, considering the quantity of work that is in them, are cheap at the money asked for them. Technically, they are known as two-feet two-fold arch joint boxwood rules, that is to say, the rules of the better class. If the amateur buys an arch joint rule at 1s. 6d., he will find it answer his purpose in every particular; and if he choose to content himself at the beginning of his career as workman with a common rule at 10d., it may be good enough for him, especially as rules of this class at times get accidentally laid on the ground, or fall to the ground unnoticed, and in this position are stepped upon and broken, which necessitates the purchase of another, and, in nine cases out of ten, a better one. I will say nothing about the chalk line at present.

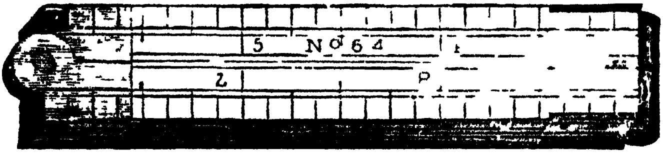


FIG. 48. Carpenter's Rule.

91. The amateur carpenter cannot by any possibility do without a square, for he will always have to do his work "on the square" by aid of the square; and it will be in demand, very frequently, when he is at work for

The square.

setting out lines at right angles to the arris or edge of a piece of wood, that is either in the rough or which has been planed and properly squared up. The joiner's square is depicted in Fig. 49, from which it will be seen that it consists of a steel blade, set at right angles to the inside face of the stock itself, which is always faced with brass to preserve the wood from injury by blows or other causes, the wood that is used being of rosewood or ebony. Squares are made with blades 3, 4½, 6, 9, and 12 inches long, and are sold in accordance with the sequence of sizes thus given at 1s. 4d., 1s. 6d., 1s. 8d., 2s. 4d., and 3s., each in rosewood, and 1s. 6d., 1s. 8d., 1s. 10d., 2s. 8d., and 3s. 6d., in ebony. If the amateur carpenter supplies himself with a 9-inch square in rosewood at 2s. 4d. he will find it in every respect sufficient for his purpose. The stock is made of some thickness, say ½ inch, as shown in the illustration, that its face may be applied to the edge of the wood, and the iron laid on the surface which requires marking, and which is adjacent to and at right angles to the side to which the face is applied. A good 9-inch square in iron throughout of the kind known as "Try and Mitre Squares" may be had for 1s. 8d. It is claimed for these squares that as "the stocks are made entirely of iron, they are not liable to shrink like the ordinary wooden stock squares, and consequently will bear exposure to any atmosphere and they are not heavier than ordinary squares." This is owing to the construction of the handle, which is pierced to reduce the weight, and more than this the iron stocks are of no great thickness. The stock is set on to the blade with the upper end, cut at an angle 45°, so that mitres may be set out by the aid of the square as its name implies; but this can be had in the class of wooden-stock squares known as "best ebony combination square and mitre," in which the 9-inch size is supplied at 3s. 3d. If you have any reason to doubt the accuracy of your square, apply it to a piece of wood properly squared up and trued on one face, selecting this face for application of the stock, and draw a pencil line against the outer edge of the blade. Then reverse the square, placing the stock against the wood in the opposite direction, and the outer edge of the blade against the pencil line. If the edge of the blade and the pencil line coincide the square is true; if they do not, the square is not true, and is consequently useless unless rectified, which is a difficult matter and can only be rectified by a maker of these tools.

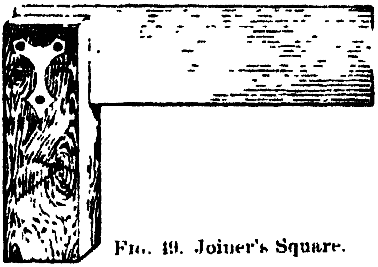


Fig. 49. Joiner's Square.

Test for square.

The edge of boards, etc., on the face of thicker wood to which the stock of the square is applied should always be shot and trued up.

Marking gauge.

92. A bevel is a very useful appliance. I bought one once for the small sum of 2d. in the Walworth Road, I think, or at all events somewhere in the South of London; and this I have found of service to this day. It is in fact one of the most profitable investments I ever made in the way of tools. I will tell the amateur, at some time or other, how he may make one for as little money. But for the present we may leave this without further notice as well as the mitre box and all gauges, with the exception of the marking gauge, which is indispensable. It differs from the mortise gauge, a description of which, together with the use to which it is put, I will defer until we come to the making of some article in which mortises and tenons form an essential feature. The marking gauge, as the reader will understand from Fig. 50, consists of a solid head of the form shown, which moves stiffly along a wooden bar, which is inserted in a hole cut in the head for its reception. Through this bar a pin passes, and when it is desired to mark out a line at any short distance from the edge of a piece of wood, which edge should be planed smooth, and trued up, or rather the side of the wood of which the edge forms one of the boundaries; the distance is set off by aid of the rule, between the "business end" of the pin, as the Americans put it, and the face of the head of the mortise that is nearest to the pin; and when the head has been moved down the bar to the distance required, it is fixed in position by the action of the boxwood thumbscrew that is shown in the illustration. The face of the head nearest the pin is then placed against the side or edge of the piece of wood immediately adjacent to the surface on which the marking is to be made, and which of course is parallel to the edge or arris of the wood, and the head is then firmly grasped and pressed against the wood, and the marking gauge moved backwards and forwards until the required mark is sufficiently defined. Gauges of this description are made of beechwood, and may be bought for 9d.

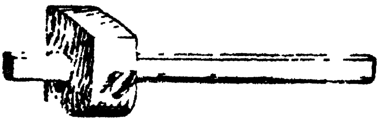


FIG. 50. The Marking Gauge

Compasses.

93. A spirit level is both useful and desirable, and in some kinds of work absolutely necessary; but we may defer the consideration of this and of the straight edge and plumb and level until we come to deal with work in which their aid is required. I would, however, recommend the amateur woodworker to have among his tools a pair of compasses, as they are desirable for striking circles and arcs of circles. Of course, this can be done

easily enough on an emergency, and when a single circle only is required, by means of a wire nail, a piece of string, and a pencil; but when a number of circles or arcs of circles are required, it will not be possible to strike them by means of such simple appliances as these with any certainty of correspondence. Therefore, it is better to have a pair of compasses; and I would recommend the purchase of a pair 7, 8, or 9 inches in length, of the kind shown in Fig. 50. These are known in the trade as Wing Compasses, and the best to buy are the Lancashire Black Wing Compasses. These are sold in fifteen sizes, proceeding upwards from 4 inches to 12 inches inclusive, by increments of 1 inch, and from 12 inches to 24 inches, by increments of 2 inches. In price they range for the first group of sizes from 1s. 4d. to 2s. 8d., and for the second group from 3s. 9d. to 7s. 6d. each. The sizes I have recommended are sold the 7-inch and 8-inch sizes at 2s. and the 9-inch size at 2s. 3d. It will be noted that in the wing compasses the outer leg works on a strap or wing which is fastened to the inner leg of the compasses which is fixed. The other leg works freely on the wing, which is in the form of an arc of 45°, so that the movable leg may be extended until it is at right angles to the fixed leg of the compasses. A thumbscrew works in the thick part of the movable leg of the compasses, and is screwed down on the wing plate to prevent the alteration of distance between the points of the legs, when a number of similar circles or similar arcs of circles have to be struck. Cheap bright wing compasses may be bought at 1s., 1s. 6d., 2s., and 2s. 6d., and plain compasses in seven sizes, from 4 inches to 10 inches in length, at prices ranging from 1s. to 2s. 3d. The advantages of black tools over bright tools is that the black tools do not rust on exposure to damp or rain, whereas bright tools will rust on the slightest provocation. I always give the preference to black tools, whether they be compasses or bits, or even tricycles and bicycles, about which bright parts should be as few and far between as possible. It is as well to have a pair of 4-inch plain compasses as well as the larger ones. They will be found to be very useful, especially in measuring distances on the wood, and then applying the points of the compasses to the rule to ascertain the measurement.

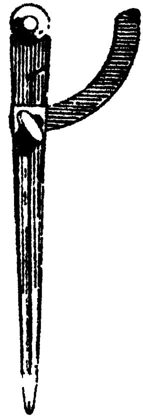


Fig. 51. Wing Compasses.

Scriber.

94. The only class or section of tools that yet remain without comment are, the scriber, the reamer or rymer, the pencil and the knife. The small compasses to which reference has just been made will always serve as a scriber whose office it is, when the straight end of a

flat board is to be dropped on an irregular surface of any kind so as to fit it exactly. For example, suppose A B in Fig. 52 to represent in section, the broad sill of a casement window which through age, or long use, has dropped throughout its width, and has assumed the form shown in the illustration, which is of course exaggerated in the figure the better to serve the purpose of explanation. It is desired to have the side of the opening in which the window is set, and at the same time to cut the end of the board in such a way that it may fit closely and accurately on the hollow window sill. To do this with perfect accuracy, the points of the compasses are opened until the width of the widest part of the space between the rectangular end of the board and the hollow of the window sill is attained. The point of the lower leg of the compasses is then placed at B, when the point of the upper leg will touch the surface of the board above at the point C. The point of the lower leg is then drawn along the hollow of the sill and the point of the upper leg when pressed against the wood, preserving its parallelism, or equality of distance from the point of the lower leg, will trace out the dotted line C D. When the parts between C D and the corners A B of the board have been cut away by causing the saw to follow the course of the dotted line C D, the end of the board will assume a rounded form, which will drop into the hollow of the window sill, and fit it exactly if the scribing and subsequent sawing has been properly and accurately done.

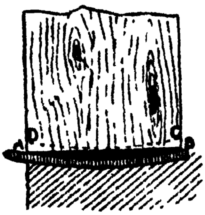


Fig. 52. Scribing End of Board to fit Hollow.

95. The reamer or rymer is a four-square steel tool, set in a handle and terminating in a sharp point, which is used for marking lines on wood, which are usually done with a pencil. The object in marking any line in this way is to get it as close as possible, and, therefore, as coincident as possible to the edge of the blade of the square or edge of the rule which is used as a tool of guidance in setting out the line. This mode of procedure is useful in setting out mortises and tenons or any kind of work in which exactness and great nicety of fitting is required. Pencils are indispensable, and the amateur wood worker should buy these by the dozen. It matters not whether they are oval, which seems to be the recognised shape for carpenter's pencils, or round, which is the form of all ordinary pencils. A pencil is a pencil, and as long as it can be brought to a decent point with knife or chisel, and is made of lead which will make a sufficiently well-defined mark, and which in order to do this must be neither too hard or too soft, it will afford all that can be required in this direction. I have spoken of a

Reamer, pencil, knife, etc.

knife; but it is not in any way such a knife as my readers think it may be. No, it is an old table-knife, or dessert-knife, the blade of which has been broken across pretty nearly at right angles to the back, and presents in front a fine rectangular point. Such a knife is far better suited than the reamer for drawing or marking out lines in closest proximity to the tool of direction that may be used, whether it be rule or square. I do not recommend the amateur to snap one of his household set of knives asunder for the purpose of obtaining even so useful an appliance as this; but I most strongly advise him if any unforeseen accident happens to a knife, to place it *hors de combat* for its natural use, to annex it at once, handle and broken blade that remains in it, and to keep it for the purpose mentioned above.

Personal explanation.

96. And now let me move the adjournment of the subject for a short time, as they do in the House of Commons, for the purpose of making a personal explanation. I am sure the majority of my readers would rise and support me for this purpose if we were holding converse face to face; and I am sure they will not grudge the few lines that I wish to devote to this purpose, but willingly assent in their hearts to give me time and space for the ventilation of the matter that is now uppermost in my mind. I have always been accustomed when mentioning any tool or appliance that I thought worthy the notice of amateur mechanics in general, to state the name of the maker or seller thereof, and to specify the price and say where it might be obtained. I have been blamed and called over the coals for doing this and accused of black-mailing, or in other words of accepting payment for my advocacy of the tools and appliances that I have described in the various books that I have written and the magazines bearing on practical work of all kinds that I have edited. Those who know me are very well aware that I would not condescend to anything of the kind; and so it is to those who do not know me personally that I make this explanation. I do not follow this course now, and I shall never follow it again, because I have found that many dealers in tools have the tools that they sell branded with their own names, which induces buyers to think, as I thought once, that they were the *bonâ-fide* makers of the tools in question. Now dozens of dealers in tools, by the complaisance of the maker, are permitted to have their own names indelibly imprinted on the tools which he makes but which they sell. I think this unwise from many points of view, because the presence of the maker's name on any tool should be a guarantee for the goodness and genuineness of the tool that is offered. It is, however, manifestly invidious to all others who sell tools bearing their own names that one man in particular

should be singled out for mention, and that the rest should be ignored and left out in the cold. I shall mention the names of tools and appliances, and I shall mention, without doubt, the names of many things of one kind or another that will be generally useful to amateurs. I shall mention the names of makers and manufacturers and of such dealers who have done something special at my request to further the end that I have in view, which may be summed up in three words, namely, "Help for self-helpers". I shall not, as a rule, give addresses, but leave it to every man whose specialities may be mentioned to be his own trumpeter, and to tell my readers where he may be found by means of what Shakespeare terms "bold advertisement".

97. I prefer my own plan of stowing away tools, but others do not; and many like the old time-honoured chest, and are inclined to stick to it. For such as these Messrs. Moseley & Son [High Holborn, W.C.], who are makers as well as dealers, have, in accordance with my notions of fitness in these things, designed a special and highly convenient tool-chest for amateur wood workers who are inclined to pursue Home Carpentry in all its branches on the lines which will be laid down for them in this volume. The tool chest itself is well and strongly made of well-seasoned timber, and will be supplied separately, that is to say, untenanted by tools, for £2. It will be known as the "Amateur Wood-Worker's Own Tool-Chest," and intending buyers should look at it before buying anything else in the way of either chest or cabinet. I do not pretend to cry it up as the "best thing of its kind in the world,' but I would fain point out that it is good value for the amount asked for it; and that any one who buys it, rather than make such provision for his tools as I have already indicated and described, cannot go far wrong. I will say all that is necessary about the tools with which it should be stocked, when I have described the construction and character of the chest, and in speaking of the tools I will give a list of them with prices.

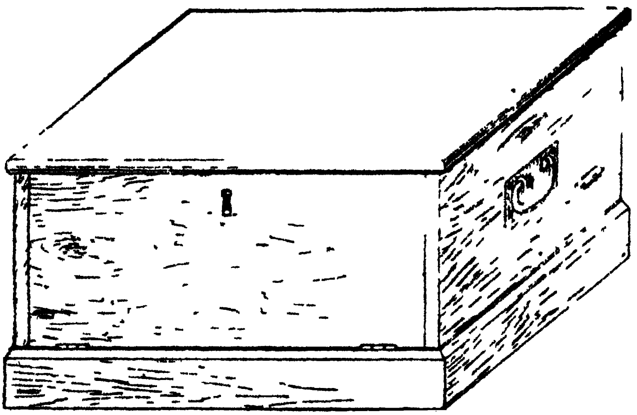


FIG. 53. External View of Tool Chest

Tool chest for amateurs

98. The external form of it may be gathered from Fig. 53, and its internal arrangement from the sectional view given in Fig. 54, and the perspective view of interior with the lid lifted, the front let down, and the working of the interior shown by partial withdrawal of drawer, etc., in Fig. 55. **Dimensions.** Externally, measures 2 feet 4 inches in length, 1 foot 5 inches in height, and 1 foot 4 inches in depth. The lid is provided with a nosing that causes it to project slightly beyond the body of the box, and is finished with a slight moulding or member below, to render it dust-proof as far as possible. When the flap is let down and the cover lifted, it will be found that both cover and front are provided with fittings for the reception of various kinds **Cover or lid.** of tools, which, when the box is open, are at once conveniently placed for handling; for the cover stands upright, or, rather, has a slight inclination backwards, and the front assumes a desk-like slope, being hinged to that part which is fixed, and to which the plinth is nailed, screwed, or otherwise fastened. When the box is closed, the tools on the interior of the cover—chiefly saws and tools of this kind drop singly and comfortably into the space immediately below the cover and above the drawer. The tools on the front flap also drop easily into the space between its interior surface and the exterior of the drawer tray and well, this space being 5 inches in width or depth, while that below the cover is 2 inches or thereabouts. Below these, and in **Flap front.** the space between the fixed part of the front to which the flap is hung, a space of 5 inches in width, and extending the whole length of the **Space at bottom of box.** box. This affords suitable space for the reception of the glue-pot, of which I have said nothing, for the same reason that has induced me to reserve mention of other things—namely, the hatchet and two or three other large tools.

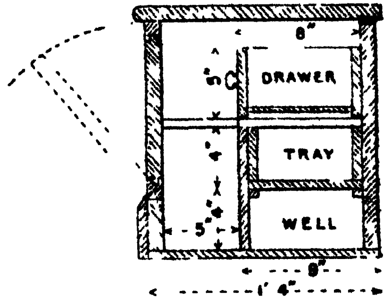


Fig. 54. Sectional View showing arrangement of Interior.

99. Immediately contiguous to this lowermost space there is a well 9 inches in width over all, abundantly supplied with divisions for **Well.** the reception of nails and screws, and carpenter's or builder's ironmongery of various kinds, such as buttons, hinges, and the multiplicity of articles of this kind, of which the amateur mechanic has frequent need, and of which he should keep a small stock in hand, ready for immediate use when wanted. Above the well, which is 4 inches in depth, and so deep enough for the

introduction of a shallow tray at the top, should the amateur desire it, is a tray **Tray.** 4 inches in depth outside measurement, intended for the reception of chisels, gouges, bits, and all the small tools of this description which the amateur mechanic requires: and immediately over the tray which, like the well, extends the whole length of the interior of the chest, is a drawer which is meant for the reception of planes and all tools of this description for which **Drawer.** no room can be conveniently found in any other part. The drawer itself is 5 inches in depth, and 8 inches wide internally, which renders it suitable in every respect for the purpose for which it is intended. When the flap front is let down and the cover is raised, there is nothing whatever to hinder the removal of the drawer, which can be pulled out and entirely removed when access is required to the tray below. In the same manner the tray can be lifted out, and, like the drawer, can be put on one side when it is required to put anything into the well or take it out,

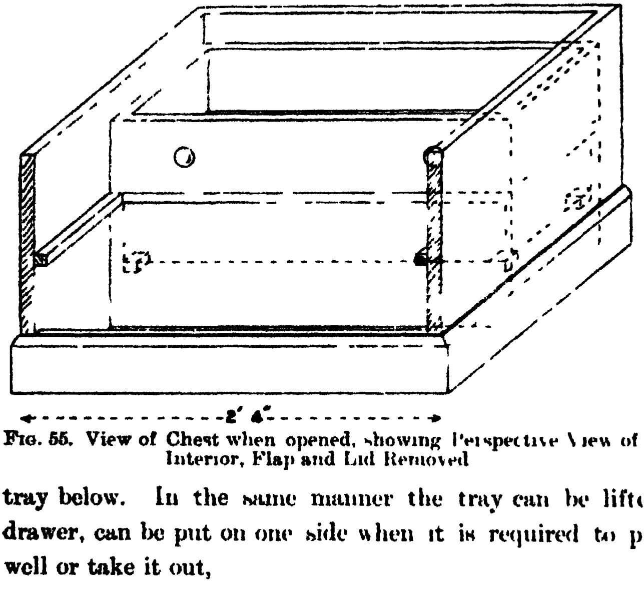


FIG. 55. View of Chest when opened, showing Perspective View of Interior, Flap and Lid Removed

100. Referring to the well it must be understood that this is to be regarded as a place wherein to store nails, screws, etc., and to keep such things in stock, rather than as a receptacle from which to take every nail or every screw that is used singly when wanted. It is in no way intended to supersede the nail box and screw box, which are two of the things that the **Nail box, screw box, etc.** amateur cannot possibly do without, and which he can make for himself with the greatest ease in an hour or two. For each of these a strong shallow box or tray is required, about 3 inches in depth, interior measurement, 12 inches long and 8 inches wide. This must be divided longitudinally by a stout piece of wood, projecting upwards above the sides of the box, in the centre of the wood, but not exceeding the height of the sides at either end, so as to admit of a handle being made by which to carry the box from place to place, by making or rather cutting a hole in it by aid of the

centre bit and key. To make my meaning perfectly clear, I give, in Fig. 56, the front elevation of the nail box, from which the shape and construction of the longitudinal partition will be understood. The sides should be slightly grooved to the ends of the central piece, to which the sides should then be securely fastened by wire nails. On one side of the central division three smaller partitions may be inserted, dividing the whole length into four pockets, as we may call them, to take smaller nails and two partitions on the other side, which will give three more pockets or spaces wherein to put nails of a larger size. If the nail box is made entirely anew from pieces of wood cut to size and then nailed together, it will be desirable to make the grooves in the central piece and sides before the nailing together is commenced. If this be done the partitions on each side of the central piece should be fastened to it by nails driven through the central piece itself into the inner ends of the partitions. Then the ends outward ends of course of the partitions should be dropped into the grooves cut to receive them in the four sides of the box, and the sides then nailed in their turn to the ends of the partitions.

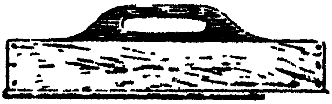


Fig. 56. Elevation of Nail

101. All this by way of an "aside," or a parenthesis, although it has been a somewhat lengthy one; and I must now give a list of the tools with which the box will be stocked and rendered as complete as possible. They may differ a little in price from those which I have named, and some which I have mentioned as being absolutely necessary to the amateur wood worker may have been omitted. Still, on the whole it seems to require but little amendment, and it is in the power of the amateur to omit any tools in the list that he does not care to have, or to exchange them for others which appear to him to be more necessary. The tools, then, with their prices, as given me by Messrs. Moseley and Son, are:—

Tools supplied with box.

	s.	d.		s.	d.		s.	d.
1 22-inch Hand Saw,	4	0	1 Jack Plane,	5	0	2 Turnscrews,	3	7
1 English Hatchet,	2	4	1 2¼-inch Smoothing Plane,	4	0	1 Marking Gauge,	0	9
1 9-inch Square,	2	4	1 Joiner's Mallet,	1	6	1 Glue Pot and Brush,	1	6
1 1¼-lbs. Hammer, London Pat.,	2	6	1 Carpenter's Rule.	1	0	1 Drawing Knife,	3	0
1 12-inch Disston Tenon Saw,	5	6	1 Pair of Pincers,	1	4	1 3½-inch Spokeshave,	1	4
American Brace,	5	6	6 Assorted Firmer Chisels, Handled,	5	0	1 Cocah Wrench,	3	6
1 Set of 24 Black Bits,	9	0	3 Gouges, ditto	2	4	1 Compass Saw,	1	10
6 Norwegian Gimlets,	2	0	1 Oilstone Tam O'Shanter,	2	6	1 Keyhole Saw,	2	0
6 Patent Capped Awls,	1	8				2 Big Mortise Chisels,	2	6
						£3	17	1

This brings the cost of tools to £3 17s. 1d., making with the tool chest, the cost of which is £2, altogether £5 17s. 1d.; and an addition must be made of 2 punches, a small oil-can and one or two other omitted items, which brings the cost up to £6.

Billhook.

Switching hook.

102. If the amateur wood-worker is living in the country, he will in all probability have a garden of considerable size, with, perhaps, a paddock, an orchard, and even a farmyard attached to the dwelling-house. He will then require tools that are suitable for country work, and chief among them will be the billhook for sharpening the ends of stakes, poles, bean sticks and pea sticks, or pea boughs as they are called in some parts of England. Should he require one he should purchase a single-edge billhook of the Kent pattern, which are made in three sizes, sold respectively at 1s. 9d., 2s., and 2s. 3d. There is no advantage, as far as my experience goes, but rather the reverse, in having a double-edge billhook, which has a sharp projecting piece at the back, which is square and straight in form, and not curved or hooked like the front. He will also find a sickle, otherwise known as a switching hook or swap hook, indispensable for trimming hedges. Of these one kind is furnished with a short handle, which serves for trimming as high as the arm can reach; but anything above this must be done with a hook at the end of a long handle. Double-edge billhooks cost from 2s. to 3s.; but these, as I have said, I do not recommend. Hooks, whether with long handles or short handles, run in price from 2s. to 3s. 6d.

Cross-cut saw, mallet, and wedges.

103. Dwellers in the country, too, may occasionally have to take down a tree, or to cut up and remove one that has been blown down, and he may have to cut down a tree or two now and then for house purposes in the farm yard or about the place, such as making gate posts for example, or to be sawn up for gates, posts and rails, and other purposes. For timber that is good for nothing else than firewood he will require something far more powerful than a handsaw. Even for the purpose of cutting it up, so for cutting down and cutting up, so to speak, he will require a nice light two-handled cross-cut saw, and for splitting and rending he will want a mallet, or beetle and three or four wedges of iron tipped with steel. But I will forbear to make further mention of such appliances as these until the time comes, when a notice in detail may be desirable. I have a reason for saying a word or two about them now pointing out, in fact, to the amateur that such things exist and are sometimes wanted; and this reason will be fully apparent before I get to the end of this somewhat long, but, I trust, not wearisome and unprofitable chapter.

Tool basket.

104. Your tools, in whatever way they may be kept together, whether in a chest, or conveniently disposed in drawers as I keep mine, will be kept in your workshop or in some special corner of the house if you have not the good fortune to possess a workshop in which to bestow them. Now it is manifestly impossible to carry your tool box about with you or even chests of drawers however small; and you must have some means of conveying such tools as you may require from the place of deposit in chief to the spot where the mending or repairing job may have to be done, whether within the house or in its environs Therefore, the amateur artisan should provide himself with a tool basket, in which he should place each tool that he may require, or thinks that he may require, with a few nails, screws, etc., of the size and sort that are wanted. It is possible to buy baskets at the fruiterer's sometimes that will serve the purpose in view; but these are never lined, and the amateur will find it far better and to his peace of mind in the end, if he buy a bound tool basket such as is shown in Fig. 57. These tool-baskets are sold in five sizes, denoted by numbers, namely, No. 1, 2, 3, 4 and 5. When merely bound, they are sold, Nos. 1 and 2, at 10d., and the other sizes at 1s. 3d., 1s. 4d., and 1s. 6d. respectively. But these are no better than the baskets I have seen at the fruiterer's, which as a rule are cheaper. If bound and lined, with pockets, the five sizes are sold respectively at 1s. 4d., 1s. 6d., 1s. 9d., 2s. and 2s. 3d. No. 3, which costs 1s. 9d., is, I think, the size most suitable for the amateur. By taking this the medium size, he will avoid the Scylla of one that is too small and the equally objectionable Charybdis of one too large. Nails and screws too in a lined basket are less capable of getting their business ends through the basket, which is rough enough if not lined. When on the job, therefore, put every tool you want into your basket, which, by the way, is furnished with a pocket or pockets, which are useful for small tools, and when you have finished see that no tool is left on the ground or floor unnoticed; take them, basket and all, back to the place from which you started; put them into their proper places; and then, on the principle of "Safe bind, safe find," you will find them all ready to hand the next time they are wanted.

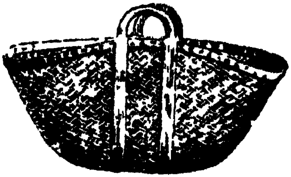


FIG. 57. Tool Basket.

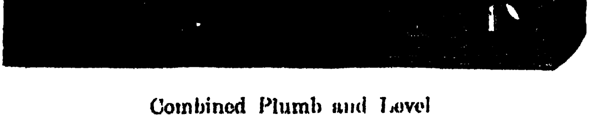
105. To every amateur whose finances will not permit of the purchase of new tools through and throughout, and who cannot go to the length of buying such a chest of tools as I have suggested, possibly Messrs. Moseley & Son might be induced to accommodate purchasers on the hire system, say by pay-

ments of 10s. per month, or 2s. 6d. per week, so that the time of payment by instalments would extend over a year or thereabouts. Another easy way is to start a club on the Starr Bowkett System, allowing the payments to gather until sufficient is in hand for the purchase of the chest, and then deciding by ballot who is to become its possessor.

A word to the wise.

106. But if all these means fail, let the amateur bear in mind the fact that there is yet a still deeper depth to be sounded and fathomed; and that there are such happy hunting grounds yet open to him as unredeemed pledge shops, and the unsavoury but withal profitable gatherings of the marine-store dealer's, who is more frequently spoken of as the "rag and bone man," as being perhaps more expressive than the high-sounding title of marine-store dealer which I have applied to him. And then there are second-hand shops of various kinds, in many of which tools, and good tools too, derelicts of some unfortunate professional brother in all probability, are to be met with. A good hunt through any one of the establishments named is seldom indulged in without reward; and at the unredeemed pledge shop and the marine-store dealer's, may be picked up in time, and from time to time, all the tools and appliances that I have laid special stress on, with the billhook, cross-cut saw, mallet or beetle and wedges, and the crowbar or "pitcher," a better kind of tool than the crowbar for making holes for the reception of posts, stakes, etc., because it is altogether bigger in every way, and therefore more serviceable for the purposes mentioned. Never turn away from a tool of any kind without having a good look at it to see whether or not it may be useful And, more than this, if opportunity offer and the price asked is very low, do not hesitate to buy anything for which there is a use; for "everything comes useful once in seven years."

Unredeemed pledge shops and marine stores.



Combined Plumb and Level

CHAPTER IV.

IMPROVEMENTS AND FITTINGS IN HALL OR ENTRANCE.

What may be done in the House—Parts of Houses open to Improvement—A Suggestion for placing Door Mats—Well for Door Mat—Construction of new Step—Narrow Spaces between Doors—Umbrella Rack—Gong—Details of Umbrella Rack—Sides and Transverse Pieces—Suggestions for placing Umbrella Racks—Suggestions for fixing to boarded Surfaces—Plugging Walls—Tool for Plugging Walls—Wooden Plug for Brick or Stone Wall—Ordinary Wood Wedge—Principle of cutting Wedges—Bracket for Gong—Rail to carry Bracket—Wall Carriers for Umbrellas, Sticks, etc.—Framed fillings for Panel—Books that run in Couples—Groove and Tongue Joint—Improvised Clamp—Halved Joint—Stop Chamfering—Chamfer Shave—Overdoors and Shelves in Halls—Pictorial Overdoors—Heraldic Overdoor—Ribbon for Names of Families, etc.—Materials for Shields and Ribbon—How to draw a Shield correctly—Provision in Recess for Bust—Busts for Overdoors—Brackets for Clocks in Halls—Bracket Table for Rail and Shelf—Bracket to support Shelf—Fixture of Flap—Table and Chair Height—Chair Seat in Hall

107. WE have seen that man is possessed of organs peculiarly adapted and fashioned by his Maker to use tools, and we have further passed over in review the appliances he requires, and the tools of which he stands most in need, if he takes to the use of tools in the pursuit of carpentry and joinery as a hobby. This has brought us to a convenient standpoint from which to look round and see what we may do with our tools now we have got them, and also what things may be done within doors in the house. We will not go further than this now, for it will be enough to consider for the present, and the things that may be done out of and about the house may be left till later on. At present, then, we will think what may be achieved in the way of home carpentry and joinery in the house; and I will make it my business to tell you and show you what man—meaning myself—has done, and, as a natural consequence, what man—meaning you, my reader—can do, provided you make up your mind to do it. I go upon the broad ground that there is always plenty to be done, even in a house of the present day that has the reputation of being complete and well finished in every respect, according to the builder thereof. At least, I have always found that there is many a thing to be done of more or less impórtance to add to home comfort and home convenience; and doubtless the great majority of householders have found this to be the case, as well as myself, take what part of

What may be done in the house.

the house you may. Of course, I cannot speak specifically of each and every individual house; I can only do this with reference to the houses in which I have resided myself from time to time, and I must leave it to my readers to apply the results of my own experience, and the instructions that are based on them, each to his own case, with such modifications as may be found necessary.

108. It is possible that some may say, "Well, I have had a good look round my house, and, after all, I see nothing that I can do to it." To this I can only reply that I have never been in any house, be it what and where it may, without seeing as I passed from room to room, many parts and points in which the house could be improved, in matters either of ornament or of utility. It may be a failing, a weakness on my part, but I cannot help it, for it is as much a matter of custom with me as it is for a duck to take to the water. There are one or two things that may be done to advantage in the entrance or hall: the staircase may be improved, perhaps, although it is impossible to alter its construction without removing it altogether. The cellars may be utilised to a far greater extent than they are; the plainness of some of the doors may be relieved with very little labour and at but trifling cost; sitting-rooms and bedrooms may be rendered more satisfactory to the eye by the introduction of a cornice here, the construction of a dado there, the introduction of a chair-rail in one room, or the addition of a moulding or simple member to the skirting of another; recesses, that are of little use as they are, may be rendered all the more serviceable by conversion into cupboards; the kitchen may be made all the more convenient by means of an over mantel, or by putting shelves, some broader and some narrower, according to the purpose they are intended to serve, in parts and places that have been utterly destitute of shelves before; and, lastly, it is often possible to improvise a piece of furniture, to evolve it, in fact, out of next to nothing, or to improve a piece that already exists to such an extent as to endow it with functions very much extra to those to what it had been limited before in its normal condition. I trust that what I have just said will act as an eye-opener in many a case.

Parts of houses open to improvement.

109. It is always desirable to begin at the beginning; and as the entrance or hall may certainly be regarded as the beginning of the house, let us make a commencement there. In some houses, things as they are will often suggest an addition that may be either pretty or useful, or probably both in happy combination. This was once the case in a house in which I once lived for many years, but which has now passed into the hands of others who now

enjoy the fruits and outcome of my labours. In the entrance-hall of this double fronted house, our first trouble was how to place the door mat in front of the door within the hall, so that it might be stepped on and used immediately on entering the house. Hitherto it had been placed on one side, and considerably within the door, the reason for this being that the sill of the door was raised to so slight a degree above the level of the floor that the door would not pass over the mat when it was laid down in close proximity to the sill. The sill was a stone sill; and herein chiefly lay the difficulty. Had it been a wooden sill, all that need be done would have been to shorten the door, and heighten the sill, by putting a slip of hard wood of the requisite thickness upon the original sill; but it would never have done to put wood upon stone; so other means had to be thought of. Some will at once ask why I did not lower the floor of the hall within the door, so as to form a well for the reception of the mat. To me such a course is always objectionable, because the well is a mere catchpit for dust and dirt, which is not always taken up when it ought to be, and which, being on a lower level, cannot be properly swept out with the rest of the hall. Moreover, the difficulty of reducing the joists below in depth to obtain a lower level for the well, framing the well round, and making all good again, is so great that I judged it better to seek for other means.

A suggestion for placing door mats.

Well for door mat.

110 The stone sill that was there was old and worn, and subject to scaling off in thin laminæ or layers. It was also very thin, and a crack ran across the centre I made up my mind therefore to remove it, and to replace it with a piece of "Robin Hood" stone, that was considerably thicker and more substantial. Fig. 58 shows the construction of the doorstep and the parts below. A is the lowest part of the door, which was shortened *quantum suf.*, and which moved easily over the inner edge of the new stone doorstep B. This was considerably wider than the old step, and was carried out with a bold nosing beyond the line of brickwork that supported it, which is indicated in the diagram by a section of the air brick or grating C, which was a very long one, and served to admit air into the cellar space below, and provide for ventilation, the air taking the course

Construction of new step.

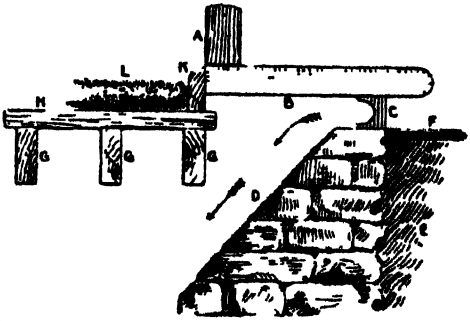


Fig 58' Sectional Diagram showing Construction of Doorstep, etc shown by the arrows. This brickwork rested on a very rough wall, D, that served as the foundation walling of the house, and was built of lumps of chalk, bits of Kentish rag, clinkers, and, apparently, any rough material that the builder, who, by the way, was "Poor Old Uncle," could lay his hands on. This wall butted against the earth, and, as there was no space, as there should have been, between the other surface of the wall and the earth, it gave cause for damp in that part of the house, which, I am sorry to say, extended to the walls above. The earth, E, was covered with a thin crust of cement F. The joists that carried the flooring of the hall, H, are shown at G. The inner edge of the stone step was masked and almost hidden from view from within by a slip of oak, K, which was nailed to the skirting, and extended the whole width of the hall. Against this the mat, L, was placed, over which the door moved easily enough, as may be seen. It must be borne in mind that Fig. 58 is only a sectional diagram. The doorstep rested at each end on brick work, the central part only of the top of the walling below the step being cut away in a sloping direction as shown, to admit air to the space below, as already said, and a few rays of light that went but very little way towards lighting purposes.

111. I have said that an improvement in the existing state of things, or a convenient addition, is often suggested by local circumstances; and I will now give a case in point with reference to the very same entrance hall. It was of some length, extending, in fact, from the front to the back of the house, but it was narrow, being no more than 6 feet in width. Two of the doors in the hall were very close together, the space between the external mouldings of the framework being no more than 20 inches. This afforded a nice opportunity for an addition of some kind or another, and I was much exercised in my mind as to what I would do there. Do something I must, and as there were several ways in which the space between the two doors might be utilised, I was almost as much put to it to decide as Buridan's hypothetical jackass was supposed to be, if placed between two supplies of food of the same kind and of equal attractions. Knowing from long experience that ladies like to have a last lingering look at themselves in a looking-glass to see that they are "all right"—*à quatre épingles* as Monsieur on the other side of the silver streak has it—before emerging from the precincts of the house into the outer world, I thought at first I would put up a pretty bracket about table height or a little higher, say sideboard height, between the two doors, and fill in the space above the bracket and the top of the doors with a long and narrow pier glass. But had I decided on this, I

Narrow spaces between doors.

did not quite see what I could do with the space below the bracket, unless I had filled it in with shelves arranged in Japanese fashion for *bric-à-brac*; but this I was entreated not to do, as the position was not altogether a safe one for articles comprehended under this term, and that the introduction of such things would only add to the work of cleansing, which was religiously carried out at certain fixed periods with a certainty only paralleled by that of Death and quarter day. Meanwhile, another idea had occurred to me; and as this was by no means open to the same objection, I proceeded to carry it out.

Umbrella rack.

112. A glance at Fig. 59 will show you, far more quickly than I can tell you, what I did with the space between the two doors, and to what uses I put it. Lastly, although an ordinary umbrella stand is a very desirable piece of hall furniture for holding umbrellas when wet, it is decidedly better to have something else in which to keep umbrellas when dry. So I contrived and fixed an umbrella rack below, between the mouldings of the doors, which, if I remember rightly, projected about an inch beyond the surface of the wall. It does not look very much of an affair in Fig. 59, which merely shows its front elevation; but I will give you the details presently, and then its construction will be understood all the better, as it will be shown more clearly. Its purpose, however, is sufficiently apparent inasmuch as it is indicated by the solitary umbrella that I have sketched in the rack. When the rack was fixed in position, I proceeded to put up a gong above it, which is always a useful thing in a house so useful, indeed, that, in my opinion, no house that holds a family should be without it. Getting up and getting down to breakfast is oftentimes a difficult matter with many, and the excuse for not putting in an appearance at the proper time is, "Didn't know it was so late, I'm sure. Very sorry, but couldn't help it, for I wasn't called." Now, a vigorous and continuous drumming on the gong, after the manner of the drummer of Tedworth, leaves no real room for excuses of this kind; and, further, it serves to warn members of the family who happen to be within doors that meals are ready to be eaten if they are ready to eat them, and no one can say that he or she

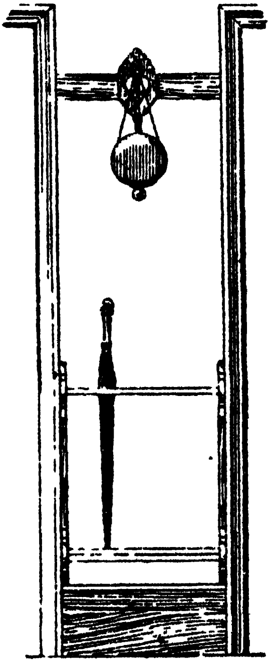


FIG. 59. Utilisation of Space between Doors for Gong and Umbrella Rack.

Gong.

is called too late for dinner, to which most people have the same objection as the accommodating individual who was accustomed to declare that he didn't care a scrap what friends or foes chose to call him as long as they didn't call him too late for the midday meal.

Details of umbrella rack.

113. But now let us pass on to the details of the umbrella rack, which was made of oak, ⅜-inch thick. It consisted of four parts only, namely, two side pieces and two transverse pieces. Although I remember the height and width of the space between the doors, I do not recollect with exactness the precise dimensions of the side pieces, a side elevation of which is shown in Fig. 60; but I am not far wrong in saying that they were close upon 2 feet 3 inches in length by about 2¼ inches in breadth. This was the extent to which it showed beyond the mouldings of the doors, so an inch more must be allowed to drop within the mouldings, the line A B representing the front edge of the moulding. The side pieces were shaped as shown in Fig. 60 at top and bottom, and a shallow groove was made on the inner side of each projecting member to receive the transverse pieces, which were 19¼ inches long and about 3 inches wide. When the side pieces were shaped, as shown in Fig. 60, they were chamfered all round, that is to say, the outer edge was taken off to the extent of ⅛ inch, and then the inner side received the same treatment. This added considerably to the light appearance of the rack. The transverse pieces or rails are shown in plan in Fig. 61. The upper rail was pierced with six holes, about 1½ inches in diameter, which is sufficient to take any umbrella which is not bulged out and swollen to the size of that which was carried by Sairey Gamp as shown in plan at A, and in section at A′. The lower rail was differently made. It consisted of two members; of which the lower one was solid, and the upper one, which was placed upon it, was pierced with smaller holes, into which the points of the umbrellas were dropped. The pieces were French polished before fixing. The side pieces were then held in place by a couple of oval brads, which entered the mouldings surrounding the doors; and the rails, which were cut full in length, so as to jam into the grooves in the side pieces, and by fitting as closely and accurately as possible, pressed the side pieces tight against the mouldings of the doors, were then forced gently in, and the whole structure was then complete.

Sides and transverse pieces.

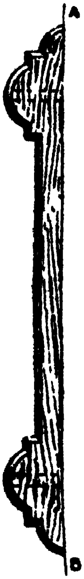


FIG. 60. Side Elevation of Side Piece.

114. Now, it by no means follows that everybody can find in their hall or entrance to the house a space so conveniently situated between two doors

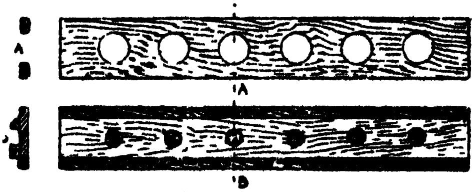


FIG. 61 Rails on Transverse Pieces in Plan. A. Upper Rail. A′. Section along A B. B. Lower Rail. B′ Section along A B.

to enable them to construct an umbrella rack on the same lines, and fix it in the same way, so as to have the lower points or rather terminations of the side pieces resting on the skirting, as shown in Fig. 59; but it will be found practicable, I think, in every house, to find some nook or corner, or to select a position even against the wall of the hall or passage, where an umbrella rack similar to that which I have described could be constructed. I should have no difficulty whatever in the house in which I lived after leaving that in which I put up the rack just described, and in which there is a porch, the interior of which forms a vestibule which is separated from the hall proper by a glazed door, access being obtained to the hall itself by means of a single step. This is shown in Fig 62, in which A represents the step rising to the hall, and B the door above it; C and D being pieces of the partition, also glazed, which form the hanging style and the falling style of the door, that is to say, the upright on one side to which the door is hung, and the upright to the other against which it shuts, and in which the plate that takes the catch and bolt of the lock is placed. Against the two side panels thus formed, racks sufficiently long to take three umbrellas on each side could be placed; or racks for three or more, if needed, could be placed along the sides of the vestibule. Another alternative would be to turn the corner as suggested in Fig. 62, and so provide for five umbrellas or sticks on each side. Side pieces may be put up, if preferred, but there is no occasion to go even so far as this if any difficulty be found in fixing the side pieces, for the transverse rails, which are pierced to receive and support the umbrellas, may be lodged on neat brackets, either of wood or iron, as may be preferred.

Suggestions for placing umbrella racks.

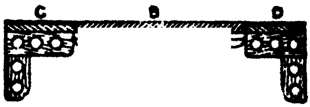


FIG. 62. Suggestions for Placing Umbrella Racks.

115. There are indeed such a multiplicity of ways of fixing things of this kind that one might fill pages in going into details with regard to them. Against a wood surface fixing is always easy and simple, especially against match boarding. A very easy way which will commend itself to the unskilled amateur, and which I will take the opportunity of mentioning here, is to screw slips of wood to the inner surface of uprights or rails, and then to attach to the surface by passing screws through these at right angles to the

Suggestions for fixing to boarded surfaces.

direction taken by the others. Thus, supposing we wished to fix a set of shelves to a boarded surface, as, for example, match-boarding, and A represents the match boarding in section, and B a portion of one of the shelves also in section, we can first screw a slip, say an inch square, to the inner edge of the lower surface of the shelf, the screw passing, as shown at C in Fig. 63, in an upward direction, and then fix the slip to the match boarding by putting screws through the slip in a horizontal direction. It is desirable to screw one slip to the under part of the top shelf, and another to the under part of the bottom shelf, so that the whole weight of the shelves may not be dependent on one slip only; and if the shelves be very heavy, it is safer to use even more than two slips. This will often be found to be a convenient method of fixing other things than shelves; for example, the upright sides of the umbrella rack might be fixed to a wooden surface by screwing a slip to either the outer or the inner surface of each upright, preferably to the inner surface, for when screwed to the upright surface it might prove a disfigurement. If the shelves that are fixed in this manner be wide, it will be necessary to use a long spindle-shaped screwdriver of the so-called engineer's pattern; but to avoid this, the slips may be affixed to the woodwork first of all, due care being taken to ascertain that they are properly level, and the shelves may then be attached to the slips, the screws being passed in *downwards* through the top shelf into the slip, and *upwards* through the bottom shelf into the slip, and this may be done with an ordinary screwdriver.

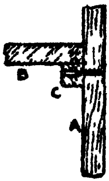


FIG. 63. Suggestion for Fixing Shelves.

Plugging walls.

116. "But how about fixing things of this kind to walls?" some reader may ask; and to this I am bound to reply that a different mode of procedure is necessary altogether. It may be that a stout nail or two put through the slip into the wall will be sufficient; but if the mortar be soft and thick, or the wall itself very hard, recourse must be had to plugging, which means making a hole in the wall with a boring instrument or cold chisel, and then driving a plug of wood into the wall to take nail or screw. As the amateur workman may frequently have to perform an operation of this kind, I may as well describe it here, as the question of means, mode, and method in this kind of work will be settled at once and for ever, as far as this particular volume is concerned. In plugging a wall that is papered, either in a passage or a room, for any small kind of work, as, for example, putting a plug in to take a nail on which to hang a picture, or in which to drive a nail for any purpose of fixing small things, it is desirable to

avoid injury to the wall as much as possible. To do this, a hole circular in form should first be worked in the plaster surface as deeply as it is possible to go, with a metal tube—a piece of gas piping will be found convenient for the purpose—the edge of which has been well sharpened with a file. Fig. 64 will show the kind of tool I mean; and for clearness' sake it is shown as divided up the middle as far as the cross handle, into which the upper part of the piece of hard wood with which the pipe is tightly plugged at the upper end, is mortised with a square tenon tightened with a wedge. With this a circular hole is cleared in the plaster, as I have already said. Further, perforation or brick splitting in the wall itself must be done with a small and fine cold chisel, just sufficient being done to admit of the entrance of the point of the plug, which should be otherwise shaped to fit the hole. If the work be carefully done, and the plug faced, and any openings between the plaster and the plaster filled with plaster of Paris, and the surface papered over or tinted as may be necessary, there is no permanent disfigurement of the wall.

Tool for plugging walls.

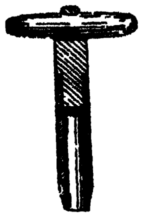


FIG. 64. Tool for Boring Plaster, etc.

117. Plugging walls to admit of driving in big nails to carry or hold up heavy weights, when the plug is driven in between bricks or stones, is effected in a different manner. Some will content themselves with driving in a piece of wood in the form of a wedge; but this is more apt to split and more likely to draw than the plugs I am about to describe. Take an oblong piece of wood, rectangular in form, and with a chisel cut away the upper left-hand corner in a sloping direction, as shown at A in Fig. 65, and then cut away the lower right-hand corner at B in the same manner. The piece of wood, as will be noticed, is wedge-shaped; but the upper and lower surfaces of the wedge that are inclined to each other at the same angle, and would meet in the same straight line were the triangular planes carried far enough, have an inclination different to the surfaces that would have been obtained if the wedge had been made in the usual way, as shown in Fig. 66. Of course, the wedge may be made finer in the edge by cutting away more of the sloping surfaces, and the edge of the wedge may be brought to a line by sloping away from a diagonal line drawn from C to D, to another drawn from D to E, and doing just the same on the other side. If the amateur workman will take the trouble to do this, he will arrive practically at full comprehension of my meaning, and at the

Wooden plug for brick or stone wall.

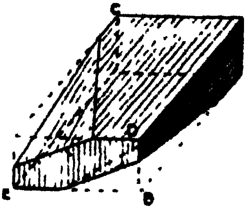


FIG. 65. Wooden Plug for Brick or Stone Wall.

same time acquire facility in making wedges of this kind—an acquisition which he will find extremely useful to him in his work.

Ordinary wood wedge.

118. The formation of the ordinary wood wedge is shown in Fig. 66. This may be spoken of as a straight-cut wedge, which is driven straight forward and enters in a direct manner, while the wedge described above and figured in Fig. 65 may be described as a skew-cut wedge, which, when driven in, turns slightly in its course, and therefore may be said to enter indirectly. It grips the surfaces against which it bears, and holds with the utmost tenacity far greater, in point of fact, than the holding powers of the ordinary wedge. This, as may be seen from Fig. 66, which is formed by cutting away the piece B C D E, on one side, and then the similar and equal piece, A C D F on the other. This kind of wedge is used for driving into saw kerfs to wedge up the handles of tools, such as hatchets pickaxes, mattocks, etc., and all kinds of tools in which the handles are inserted in iron sockets or eyes, and also for wedging tenons and other operations in carpentry and joinery in which wedges are required. The wedge for plugging walls is a wedge of a peculiar character, distinct in itself, as the reader will have fully recognised by this time.

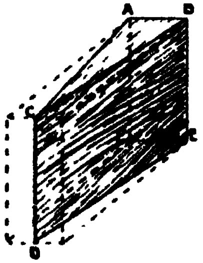


FIG. 66 Formation of Ordinary Wedge

Principle of cutting wedges.

119. Possibly I may appear to some to be diffuse and over particular in my explanations, but I am writing for those who do not know, and who wish to understand not only *how* to do any certain thing, but why it should be done in the way described. I know from long experience that amateurs like thoroughness of explanation and detail, and value it; and therefore I make no apology for being long-winded. All wedges should be cut in hard wood. Perhaps some reader may say. "Why take the trouble to cut an ordinary wedge in the manner shown in Fig. 66, when two wedges might have been formed in half the time by cutting through the block diagonally from A to the opposite corner?' You may do so if you like in the case of hard wood, such as ash or oak; but then it must be borne in mind that you will not get a flat and level end on which to plant your blows when you are driving the wedge in, and that you stand a good chance of splitting or bruising away that part of the wedge where the grain is the shortest. If the wood from which you cut your wedge be a soft and open-grained wood, you would certainly do this; but if the wedge be cut as I have shown, the chance of fracture of this kind is reduced to a minimum. As a rule, this method should be strictly observed, so that the grain of the wood

runs in a direct line from the central line of the broad end to the edge of the wedge which corresponds with this line. It must not be supposed that I am counselling the reader to cut every individual wedge from a single block in the manner described. There is no greater advocate than I am for economy in time, labour, and material. These things mean money or money value; so when the amateur requires a number of wedges, all he has to do is to find a piece of wood in which the grain, or, I may say, the line of cleavage, runs directly from A to B, and he may cut as many wedges as he wants in the orthodox way by setting out his wood and sawing it up in the manner shown above in Fig. 67, in which each wedge is properly cut.

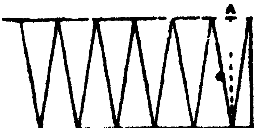


Fig. 67. Diagram illustrative of Economy in Cutting Wedges.

Bracket for gong.

120. But during this digression on plugging walls and cutting wedges, I have been losing sight of the provision which I made for suspending my gong. For this a brass carriage is provided with an ornamental projecting bracket, on the end of which the gong itself is hung by a silken cord, and there are two pegs on this carriage, one above and one below, on which to hang the little drumstick by which the gong is beaten, so that the bracket may turn upwards or downwards in either way as the inclination of the owner may prompt him to place it. Fig. 68, which exhibits a side view of the metal carriage or bracket for the gong, will show the reader exactly what I mean by saying that the bracket may be turned up or down just as he may prefer. Its hanging qualities and power are precisely the same in either position. Now in this carriage, in the ornamental plate from which the bracket issues, there are three holes by which it may be nailed to a plaster wall by means of brass-headed nails or fastened by screws to wood. I prefer myself an attachment to wood, and, accordingly, I set about providing the necessary means with the results shown already in Fig. 59. The thing to be done was to put up an ornamental piece of wood across the space that intervened between the mouldings of the doors, which, as I have already said, was 20 inches full. Consequently, I had to make my rail 20 inches full, and, to be as precise as I can—and I can be precise in this case, for the identical rail now lies before me on my study table —I made it 20¼ inches long and 2 inches wide. Further, I made it in the mode indicated by the shading in Fig. 69, showing the grain of the

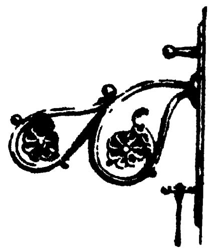


Fig. 68 Side View of Bracket for Gong.

Rail to carry bracket.

wood. To have made it of a piece of oak, 20½ inches long—the extra length is taken for the purpose of squaring up the ends—and 7½ inches wide, and then cutting away so much material at the four corners, would have been very wasteful; so I made the centre piece with the grain running vertically, and the arms, which are 2 inches in width, with the grain running in a horizontal direction, and I joined the three parts together by a groove and tongue joint, gluing the joint and bringing the pieces up close together by clamp action. I then cut out the top and bottom of the central piece in the manner shown in Fig. 69; and as the wood, when planed up, was nearly inch in thickness, I ran a chamfer of $\frac{3}{16}$ inch all round the edge, which gave a chamfer face of ¼ inch in breadth. I made the moulded edge round the central portion a little deeper. When this was French polished, it was pressed into place, and skew-nailed to the mouldings of the doors by a brad at each end.

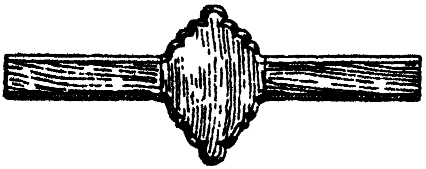


FIG. 69. Rail to carry Bracket.

Wall carriers for umbrellas, sticks, etc.

121. When nothing can be done in the manner already described to dispose of umbrellas, sticks, etc., it is by no means a bad plan to screw a few single hooks that are used for hanging up clothing to any wood surface that may be available. I say *single* hooks, because there are double hooks which are used for hat rails, one peg or hook being for the hat, and the one below for the coat. They should be disposed in pairs, and the stick or umbrella should lie horizontally upon them. When there is no wood surface to which to attach the hooks, the best mode of procedure is to make a wooden frame in the form of an Oxford frame, with the ends of the rails and uprights nicely finished with a little simple carving or other ornamentation, and to fix this to the wall in any convenient situation. The style of frame is shown in Fig. 70. At the sides small single hooks are placed, just large enough to hold and carry an umbrella or walking stick. Along the top hooks are disposed to take hats, and on the lower rail smaller hooks are placed from which to hang coats. In all cases let the hooks be of brass, unless it be necessary to resort to those of iron to lessen

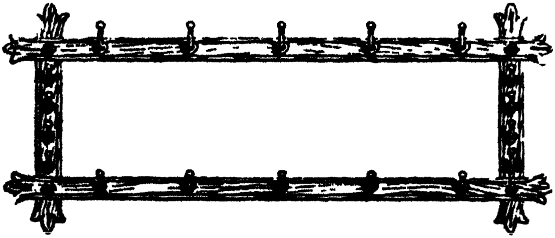


FIG. 70. Frame for Hats, Coats and Umbrellas, etc.

expense. An oaken frame with brass fillings and brass roses or small pateras at the crossings of the members of the frame always looks well. Ash frames with bronze fillings, or frames of polished chestnut with similar fillings, always present a good appearance. Walnut is as good, if not better, than oak; and frames of white wood when ebonised also look remarkably well. Frames of pine or good white deal varnished with or without previous staining, are also useful and serviceable; but for these bronze fillings, or even fillings of japanned iron, may be used. Reverting once more to the panel, the side uprights should be stop-chamfered on both edges, and so should the top and bottom rails. A very pretty effect is produced by stop-chamfering the arrises between the hooks. The four parts of the frame should be halved together. The centre of the frame left vacant in the diagram may be filled up with a fretwork panel, with a panel of Japanese leather paper, with tiles set in suitable framework, with paintings, photos, or other decorative work, similarly set in framing, or with any of the thousand and one ways of doing this kind of thing that will readily suggest themselves to any fertile and inventive mind.

Framed fillings for panel.

122. I am afraid I am often very much like a stone going downhill in my manner of writing. The further the stone gets in its course, the faster it goes; and with me the more I write the more I find to hold forth about. We are bidden at all times to resist temptation; but for the life of me I cannot, struggle as I may, resist the temptation of giving a hint or two about the filling of the frame shown in Fig. 70. But as one may as well be hanged for a sheep as a lamb, here goes; and may my readers have mercy on my sin! It is a very simple matter, as may be seen from Fig. 71, and very easily made. The framing is all halved together, and secured at the joints by small screws. The tiles are just let into rebates or rabbets cut in the framing, and held in place by a backing of millboard or thin board, such as is used for the backs of pictures when framed and glazed. For tiles which are of tolerable substance, paintings on cardboard, metal on panel, photographs, etc., may be used, placed, if necessary, under glass and suitably backed. There are, as everybody knows, more ways than one of doing a thing. In my illustration the centre panel is a floral subject, and on each side of it is a landscape. If the frame, as shown in Fig. 70, divides

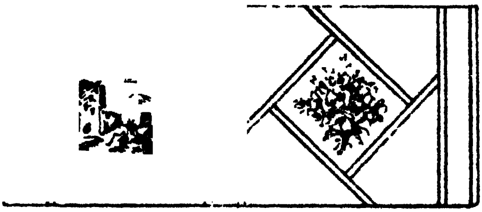


FIG. 71. Japanesque Filling for Framing shown in Fig. 70.

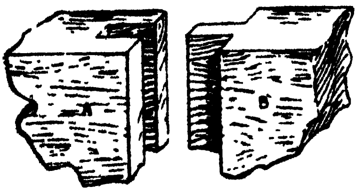
exactly into three squares, after allowing for the perpendicular bars between the panels, there need be no spaces left between them; but when this is not the case, as it is in Fig. 70, double bars had better be placed between the panels to make out the entire space. There is no difficulty whatever in the matter. Place panel No. 2 in centre, and panels Nos. 1 and 3 against the sides, and put an upright bar against each side of panel No. 2, and one to the right of panel No. 1, and another to the left of panel No. 3: and this will bring the whole length into proper and accountable appearance.

Books that run in couples.

123. I have, I know, explained the nature of joints, and modes and methods followed in jointing wood, in "*Every Man his Own Mechanic*," but it is not every reader of this volume that may or will possess the other, and references to other books are always irritating and exasperating, even if the volumes to which references are made are at hand. How much worse then is it when they are not come-at-able! I sincerely hope— and I am sure the publishers will agree with me to the echo in this—that every reader who possesses one will provide himself or herself with a copy of the other, for of a verity they are twins that are brain-begotten; and although each has a distinct individuality and aim and purpose of its own, and is, moreover, complete in itself, yet they are as much in sympathy and accord as were ever the Corsican Brothers, the Siamese Twins, and other remarkable couples of this kind, who were linked together psychologically or physiologically in a manner that it is difficult to comprehend, and, therefore, difficult to account for. I have mentioned certain modes of jointing above; and in accordance with my plan and desire to make this book complete in itself, I must say a few words explanatory of each of these joints, and touch lightly and briefly on stop chamfering.

Groove and tongue joint.

124. And first let me deal with the groove and tongue joint. In this a groove is cut in the centre of the edge of one piece of wood, as in A in Fig. 72, with a grooving plane or router, and the edge of the piece that is to be jointed to it is cut, as in B in Fig. 72, by a rebating or rabbeting plane on each side in such a manner that a projecting slip or "tongue" is left in the centre as shown, and which fits closely and exactly into the groove cut in A. The tongue in B is glued and inserted into the groove in A, and the edges of the two boards, which are also glued, are brought into close contact throughout by means of pressure induced by



. Fig. 72. Groove and Tongue Joint.

a clamp. This is all that I need say about the groove and tongue joint, the construction of which and the mode of making it I am sure every reader will now understand.

Improvised clamp.

125. "But I have no clamp," some reader will say, "and how am I to resort to clamp pressure without one?" Make two or three; it is by no means a difficult matter to do so. Take a piece of board about 3 or 4 inches wide, and some inches longer than the joint width of the two pieces you are putting together in this way. Screw a rectangular clump of wood squarely and firmly on to each end of this piece of wood, and in the hollow receptacle thus formed, lay the pieces of wood that have been connected by the groove and tongue joint. Doubtless you will find that there is still a space between one edge of the wood and one of the blocks when the connected pieces of wood are pressed closely against the other block. All you have then to do is to lay a strip of wood thicker in substance than the jointed wood against the free edge, and lock up with a couple of wedges, disposed as shown in the illustration. The more you drive up the wedges the greater will be the pressure on the connected boards, and the closer the edges will be brought into contact. If the boards be of some length, put on three of these improvised clamps, one at each end, and one about the middle of the wood, and having brought all close together by the action of the wedges, leave the joint to dry. It will be best released by knocking up the slip of wood between the wedges and the board.

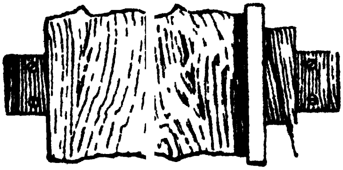


Fig 73 Improvised Clamp

Halved joint.

126. And now about the halved joint, which is the simplest joint known in carpentry and joinery. Its nature will be understood at once from Fig. 74. In each of the pieces of wood shown, which must be of the same thickness and generally of the same width, though not necessarily so, two notches are taken out of exactly half the thickness of the wood, and the width of the notch in each piece must be precisely and exactly that of the piece of wood that is to fit into it. Now it is clear that if the top piece in Fig. 74 be pressed on to the lower piece, it will go down until the surface of the lower piece fits exactly against the bottom of the notch; but if it be drawn along until it comes to the notch in the lower piece it will sink into that under pressure until the bottom of each notch is in contiguity, and the upper and lower

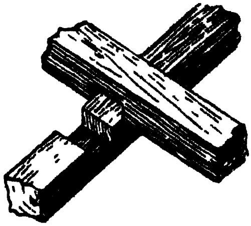


Fig. 74. Halved Joint

surfaces of each piece will be, or ought to be, exactly on the same level. If this be the case, the joint has been fairly and truly made, and may be fastened with screws, nails, or wooden pegs, as preferred. I generally use screws myself, because joints thus secured can be so readily taken apart again if necessary, unless glue has been used before screwing up the joint.

Stop chamfering.

127. Stop chamfering, and indeed chamfering generally, is one of the simplest and prettiest means of ornamentation used in carpentry and joinery, and one which I very much like myself. We will suppose Fig. 75 to represent a piece of wood that has been truly planed and squared up, and which presents when in this condition four edges or arrises. It has been determined to chamfer one of them, and when this is the case all that need be done is to run a gauge or make a pencil mark along two contiguous sides meeting in the edge that is to be chamfered, and then remove the edge with the plane until the marks made with the gauge or pencil are reached. The arris or rectangular edge has thus been removed, and a bevelled surface is left, or rather shown, in its place. If, however, the edge is to be stop chamfered, it means that a piece of the edge is to be left in its original condition. To effect this, after the wood has been marked with a gauge or pencil as before, an incision is made with a chisel in a slanting direction until the marks are reached. This is done at both ends of the distance to which the chamfer is to be carried, and the edge intervening between the slanting incisions that have been made is then removed.

FIG. 75 Stop Chamfering

Chamfer-shave.

128. This operation may be performed with a chisel or small iron plane, to a certain extent of the length of the chamfer; but the chances are that it will not be very regularly done, and will thus present a bad appearance; for, after all, the beauty of the chamfer lies in its evenness and regularity. Therefore, in carrying out this kind of ornamentation, it is better to use a stop chamfer plane, or an iron tool known as a chamfer-shave. This tool is represented in Fig. 76, and will be perhaps the best for the amateur wood worker to have, because it is much cheaper than the plane. It is used by working it along the edge, the plane surfaces shown moving when the chamfer is deep enough along the sides, and preventing the cutter, which is shown between them, from going any deeper. It costs 1s. 8d.,

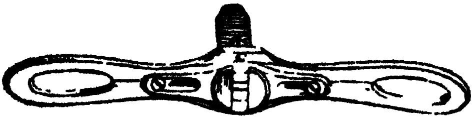


FIG. 76. Chamfer Shave

and the fences or surfaces can be set to work a chamfer at any depth from $\frac{1}{8}$ inch to $1\frac{1}{8}$ inches.

129. And now but little remains that can be said about home carpentry in the hall itself, and that little pertains chiefly to accessories that lend themselves to decorative purposes. There are, as a rule, no recesses in the hall proper that can be filled with shelves or otherwise utilised; for halls, as a rule, and especially in cottages and villa residences of all kinds, are devoid of fireplaces, which compel the projection of the chimney breast into the room, and so cause the formation of recesses on each side of the fireplace which can be devoted to many useful purposes. Overdoors, combining shelves, pigeonholes, niches, and all resting places of this kind, are out of place as receptacles for plates, old china, etc.: for however quaint and fanciful they may look on paper they are so much above the horizontal line opposite the eye of the observer that in nine cases out of ten they are passed over without notice. No one would think of keeping books and other articles that are light and movable in the hall itself, although the hall is often hung with pictures that in all probability are an overflow gathering from the various rooms of the house, in which no other desirable place or position can be found for them. The making of movable furniture for the hall is no part of the home carpenter's work, as tending to embellishment; and it is with this that we are mainly concerned. I will, however, touch on two kinds of overdoors simple in themselves, and not open to the objections already urged against these structures, a pretty mode of treating a recess in the wall, and the use and manufacture of brackets in and for many parts of the hall itself, and for carrying out many useful purposes.

Overdoors and shelves in halls.

130. In some cases where the hall is lofty and considerable space between the top of the door and the cornice, if there be any, an overdoor of the kind now to be described may be found to operate beneficially in partly breaking up the space. Of course, the general effect may be obtained to a considerable extent by hanging a picture over the door, and resting the lower part of the frame on the architrave, so that the picture hangs forward; but the method I am about to describe looks far better, and has the merit of making a nice little job for the home carpenter. If one door in the hall is thus treated it is desirable that all should be ornamented in the same manner, making allowance, of course, for any diversity of size in the pictures and difference of subjects. An easy mode of producing this overmantel will be to frame three suitable pictures, and then to connect them by placing them on a thin board cut to fit, and flush with the edges of the pictures,

Pictorial overdoor.

forming a backing to the whole. The thickness of the back board should be so regulated as to allow the lower edges of the picture frames to project slightly beyond the moulding of the door, all along the front edge; and the combined length of the pictures when put together should be greater than the width of the door, so that each of the side pictures will project from 3 to 4 inches beyond the jambs of the door, including moulding. Below the projecting pictures on each side should be placed a bold truss, having the face carved in low relief, the entire truss inclusive of the carving projecting beyond the moulding round the door to the same extent as the overhanging edge of the picture frames. On the top of the central picture a piece of carved work, or, if preferred, a piece of fretwork, is placed, carved work being preferable because it corresponds in character with the trusses; and the angles caused by the difference in height between the central picture and those at the side are also filled with carved work to correspond. If the frames are gilt frames, the carved work may also be gilt, and should be as light in appearance as it is possible to make it. A very pretty effect is produced by the use of white or tinted frames with gilt slips, plain or ornamental, intervening between the picture itself and the frame; the carved work may then be in white, relieved with gold in parts. At all events, the frames themselves and the carving must be made of materials that will harmonise with the doors and general surroundings. I have proceeded on hypothesis as far as I can, treating the subject generally; and here I must stop, for it is impossible to say what material and treatment will be best suited for the overdoor without first knowing the conditions of the surroundings. Lest there should be any difficulty found in attaching the pictures to the back board, let me say that the better way of doing this is to draw the outline of the solid part of the frame on the back of the back board, and then to bore screw-holes in the back board through which slight screws should be passed, just long enough to enter the frame to a distance of from $\frac{1}{4}$ inch to $\frac{3}{8}$ inch, and thus hold picture and back board firmly together.

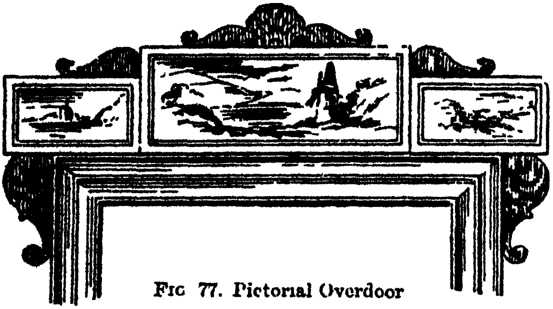


FIG. 77. Pictorial Overdoor

131. Another pretty mode of making an overdoor is given in Fig. 78; and this I will call the heraldic overdoor. Its formation is by no means

Heraldic overdoors.

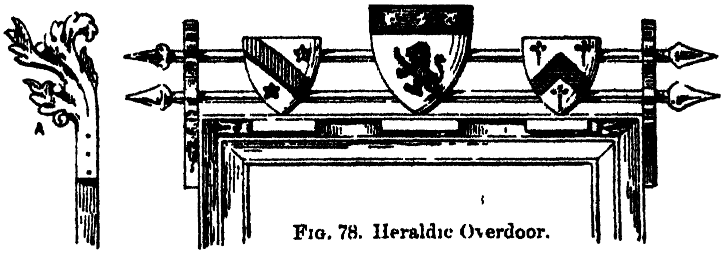


Fig. 78. Heraldic Overdoor.

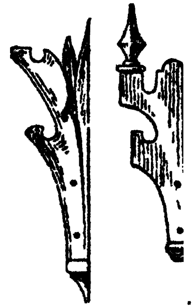


Fig 79. Alternative Forms for Bracket.

difficult. In the first place, it is necessary to make two brackets to screw to the jambs of the door on each side, the brackets being cut in such a way as to allow the lances on which the shields are suspended to enter and remain in the sockets cut in the brackets to receive them. The brackets should be of fretwork, or rather cut out as fretwork is, and then enriched by carving, as shown at A, in Fig. 78. They should be foliated, and as the remainder of the overdoor is plain in outline although rich in colour they should form a very prominent feature in the work. They should be in dark or light wood, as will best suit the general character and colour of the surroundings. The shafts of the lances should be of the same material and colour as the supporting brackets, and the heads should be gilt or bronzed. A different disposition of the supporting lance shafts may be made. For example, two lances may be used and only one socket in each bracket, the shafts proceeding upwards diagonally and crossing each other behind the central shield. In this case the shafts should be halved one into the other. In fact, there are many ways of managing the supports, but I must leave this to the ingenuity and fancy of the workman. In Fig. 78, three shields are shown, a large one in the centre flanked by two smaller ones. A row of five small shields may be used, or three small shields and two larger ones, one of the small shields being placed in the centre; then the two larger shields, one on each side of it; and lastly the remaining smaller shields on the outside, as in Fig. 78. I have given alternative forms, or suggestions for forms, of bracket-supports for lances in Fig. 79. As one who has been intensely fond of heraldry and genealogy from a very early age, I like to see my own armorial bearings, and those of every family with whom I am connected closely or remotely, shown on overdoor arrangements or on the cornice of a room; the cornice being specially contrived for this purpose. The richness

Ribbon for names of families, etc.

of heraldic colouring and the quaintness of the forms and figures used in heraldry, when properly drawn, add greatly to the ornamentation of any dining-room, study or hall, which are appropriate places for any display of this kind. To those who do not care for this let me suggest that there are the arms of the county or diocese in which they reside, as well as those of the corporate towns in the county, all of which may be appropriately used and form objects of interest. Lastly, the names of families, counties, dioceses, universities, corporate towns, companies, etc., may be shown on a zinc ribbon placed on the architrave of the door, as shown in Fig. 78, and on a larger scale in Fig. 80, in order to give the reader a better idea of the shape of the ribbon and the simplicity of its form.

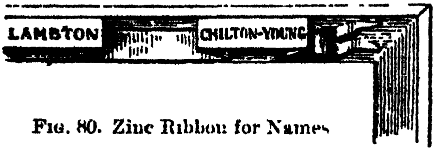


FIG. 80. Zinc Ribbon for Names

132. And here I am reminded that I have said nothing about the material of which the shields may be made. If of wood, in order to prevent any chance of fracture, splitting, or warping, I will suggest that they be cut out in the three-ply wood used very much in fret-cutting or in mahogany or cedar. for all is not mahogany which is called mahogany,—which the reader may form into two-ply or three-ply wood for himself, by gluing two pieces of mahogany together, the grain of one piece running one way and the grain of the other piece the other way, that is to say, one vertically and the other horizontally for two-ply, and by gluing three pieces together for three ply, the grain of the outer piece being vertical and that of the central piece horizontal. Put them together with the "Waterproof Fluid Glue," which is used cold, and keep them under powerful pressure applied by G clamps until perfectly dry. Do not forget to place pieces of wood between the mahogany and the jaws of the clamps, in order to distribute the pressure equally over the entire area and to prevent injury to the mahogany from indentations caused by the jaws. The shields may be made of zinc; but this is somewhat thin, and more difficult to attach to the lance shafts, unless zinc holdfasts be used, which can be bent over the lance shafts. One of these loops in the form of an unbent piece soldered on to the back of the shield is shown at A in Fig. 81, and the shape it assumes when bent round the lance shaft is shown at B. Zinc, let me say, is easily cut with a large pair of scissors. Make templets of cardboard of the shape of shield and ribbon; lay these on the zinc, and mark the outline with a reamer or any steel point that will scratch a clear and well-

Materials for shields and ribbon.

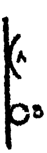


FIG. 81. Zinc Loop.

defined line. Working in zinc is by no means difficult if you have a slight knowledge of the art of soldering. If any reader wishes to know why wood of two or three thicknesses is called two-ply or three-ply, let him remember that "*plica*" is Latin for "fold," and that therefore the words merely mean "two-fold" and "three-fold". The word "two-ply" was originally applied to carpets that were woven of double thickness, such as Kidderminster carpets.

How to draw a shield correctly.

133. Ah! how to draw the shield in proper shape! There is a great deal in this, and I may as well tell the reader how to do it. Take any vertical line, and assume A B to be the length of the shield required. Divide this line—this straight line, I should say—into three equal parts, A C, C D, D B. Through C draw another straight line, a horizontal line, at right angles to A B. Then from C as centre, with C A or C D as radius, describe the circle A E D F. From E at centre with radius E B, describe the arc B G, meeting the horizontal line through C in the point G and from F as centre, with radius F B describe B H, meeting the horizontal line through C in the point H. Lastly, through A draw a straight line parallel to G H, and then through G and H draw G K and H L parallel to A B, and meeting the horizontal straight line already drawn through the point A in the points K and L; the outline of the shield accurately drawn and well-proportioned is shown by the line K L H, B G K, which is composed of three straight lines and two curved lines. This mode of outlining the form of a shield will be of use to the amateur workman whenever he requires to draw one. No matter what the size of the shield may be, the same rule must be followed in every case.

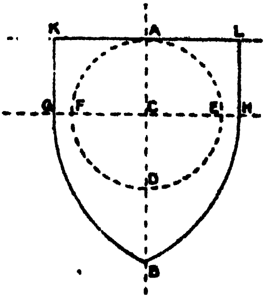


FIG. 82. How to Draw a Shield Correctly.

134. I said I would give a suggestion for treating any recess in a wall, for these are sometimes to be met with in old houses. In one of these in which I lived, in the County of Bouldershire, not far from Bythesea, a house in which the hall and passages were low and dark, a house of dark shadows and corners, meet lurking places for ghosts and goblins, there was such a recess, not very large but deep, being an aperture in the wall, which had once been a small window, but which was now hermetically sealed and match-boarded within and around, with match-boarding of very dark colour. It was nearly square in form. A lamp had first been placed on the shelf at the bottom; but the heat thrown out by the burning wick was great, and the wooden lining above got scorched, and possibly, if it had stood there much longer, we should have

suffered from fire. Then a clock took its place; but ultimately slips to form a rebate were nailed round the interior to form a lodgment against which to place a piece of fretwork, in the centre of which was a large oval opening. A pedestal a few inches in height was then placed on the shelf below, and on the pedestal was placed above,——there is no occasion for me to say whose bust was placed there; but I may say that it was not that of Clytie, nor of any statesman who was alive in the year of grace 1893, when, according to the editor of the *Christian Herald*, who apparently knows all about what has been, is, and is to be, the existing state of affairs is to come to a deadlock in two years and a certain definite number of days from the present time. We have, however, the consolation of knowing that there is some difficulty in fixing your starting point, owing to the fact that there are, or have been, a hundred and forty different systems of chronology in use at different times; and that where your starting point is so vague and hidden in the mist and fog of antiquity, it must be purely impossible to say with any certainty when you will approach the terminus of the world's history. The treatment of the recess, however, is pictured in Fig. 83; and its appearance in the place which it occupies is altogether such as warrants me in recommending my readers to bear it in mind and follow it if ever they meet with suitable opportunities for doing so, as they most likely will, sooner or later.

Provision in recess for bust.

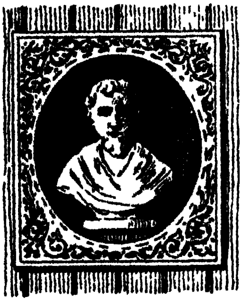


FIG. 83. Bust in Recess.

135. *Apropos* of busts, let me say that they always form desirable decorations for the hall, and may be recommended as suitable ornaments for overdoors, which may be very easily put in position; all that is needed being a shelf or bracket of the shape shown in Fig. 84, screwed on to the top of the architrave of the door. The bracket is shown as seen from above. The bracket should be fitted on the upper surface with a turned pedestal, from 2 to 3 inches in height, recessed at the top, so that the bust may be dropped into it, and rendered more secure against being upset, thrown down and broken by any accidental slamming of the door. Prevention by proper care is always better than cure by renewal. Drapery or macramo lace may be nailed round the edge of this kind of shelf as a finish.

Busts for overdoors.

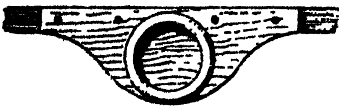


FIG. 84. Bracket over Door for Bust.

136. Clocks are always suitable objects for halls; and no clock, especially a striking clock carrying weights, should be permitted to hang on a nail without resting on a bracket below it. It may stand on a bracket without suspension on a nail, but must not hang on a nail and be dependent on this as its only support. The ordinary form of bracket, that is to say, the shelf with a carved ogee-formed support attached at right angles to it below, is so well known that it needs no description. Here is, in Fig. 85, a pretty kind of bracket of Queen Anne form and style, suitable for a clock. It is easily made. It consists of a bottom board nicely moulded along the edge, and a top rail similarly moulded in front. A good style of moulding is found in a half round with a perpendicular rise to the surface above and below, about ¼ inch in thickness, which thus forms a rectangular arris or edge. The bottom board and top rail are connected by turned spindles, which may be purchased at a very small cost, if the amateur himself is not a turner. The effect of such a bracket as this is marred by attachment of supports below, and it should be secured in place by glass-plates screwed to the back edge of the bottom board, and fastened to the wall by brass-headed nails driven through the eyes of the plates. A back may be put to the whole structure, and the glass plates screwed to the top of the back as a means of suspension, or a flat nail may be tenoned on to the inner ends of the returns of the top rail to carry plates. For my part, I like brackets of this kind better without back or rail at back, when they are intended for the reception of plaster busts or anything of light weight, such as a vase; but when clocks or anything weighty are placed in them, it is better to be on the safe side. When made of some length—say from 2 feet 6 inches to 3 feet long—they make pretty receptacles against the wall of a hall for pots of ferns and flowers; but in this case there should be a back, for security's sake. Brackets such as these look best when finished with white enamel, such as Macpherson's Foochow Enamel, or Aspinall's Enamel. But the maker can always use his own taste in selecting a colour.

Brackets for clocks in halls.

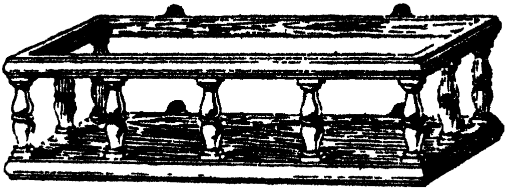


FIG. 85. Bracket Shelf for Clock, etc.

137. The bracket table or shelf is of great use in passages and entrances which are narrow, and it is also desirable in small halls to serve the purpose of resting dishes and other things necessary to the dinner-table during transit from and to the kitchen and pantries to the dining-room or morning-room.

Bracket table for rail and shelf.

Bracket to support shelf

Of course, such things as these must be made to suit the place, as far as size is concerned; but the average length and breadth of bracket tables or shelves of this kind is from 24 to 30 inches by 18 inches. "The several parts of the bracket table are shown in Figs. 84 and 85." Let me say I am now quoting from "*Every Man his Own Mechanic*," and that I am committing plagiarism or petty literary larceny on myself only. "The first thing to be done is to make the flap or shelf to be attached to a rail that must be fixed to the wall, the attachment being made by means of hinges. The shelf should be made about 2½ inches less than the width desired for the table, the entire width being made up by the rail shown in plan in the *under part* by A B in Fig. 86, and in elevation in Fig. 88. The rail may be from 2 to 2½ inches wide, but its width must depend very much on the skirting board below, shown at C D, for reasons that will be apparent presently. When all the separate parts are finished, the rail must be fastened to the wall behind and rendered immovable." Next, a bracket must be made, similar in construction to that which is shown in Fig. 88 at E; the method of constructing it is so plain that it will need no further explanation. "The ends of the upright F G must be cut as shown, in the form of circular pegs, projecting for about ¾ of an inch beyond the ends of the upright to fit into holes made one in the rail, as shown at X in Fig. 86, and the other as shown at G in Fig. 88, and Y in Fig. 87. Fig. 87 is the plan of a piece of wood shown in elevation at H K in Fig. 88. This piece of wood, when the ends of F G are inserted in the holes cut to receive them, is screwed firmly to the skirting. It is plain in order to keep F G upright that the distance from the inner edge of the rail to the hole X in Fig. 81 must be the same as the thickness of the skirting board *plus* the distance of the hole Y from the inner or straight part of the support, shown at H K in Fig. 87. The pegs F and G must, when all the parts are ready, be slipped into their places, and the rail and the support at the bottom screwed or fastened—the

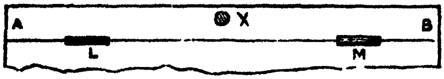


FIG. 86. Plan of Rail of Bracket Shelf.

FIG. 87. FIG. 88

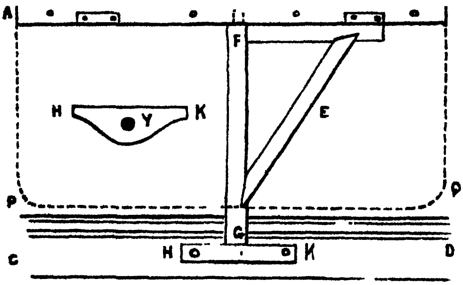


FIG. 87. Elevation of Rail and Bracket of Bracket-Shelf. FIG 88. Plan of Rest or Support for Bracket.

one to the wall and the other to the skirting board. It will then be impossible to pull the bracket E out of its place, the only motion it can have being from side to side, as it turns on its pegs on pivots F and G. When the flap, which is attached to the rail by hinges, as shown at L and M in Figs. 86 and 88, is let down, the bracket E folds away completely under the rail A B; but when the flap is raised, the bracket must be pulled out until it is at right angles to the wall behind. The position of the bracket and the flap, when the latter is let down, are shown in Fig. 87, the outline of the flap being indicated by the dotted line, A P Q B. The table, flap, and fittings may be made of mahogany or of nicely grained red deal, stained as the fancy of the maker may dictate, and French polished. The edge of the flap should be neatly moulded, and the moulding should be carried on to the rail on either side for the sake of uniformity." For small halls, and, indeed, as fittings for small rooms, few things will be found more convenient than these bracket-tables.

Fixture of flap.

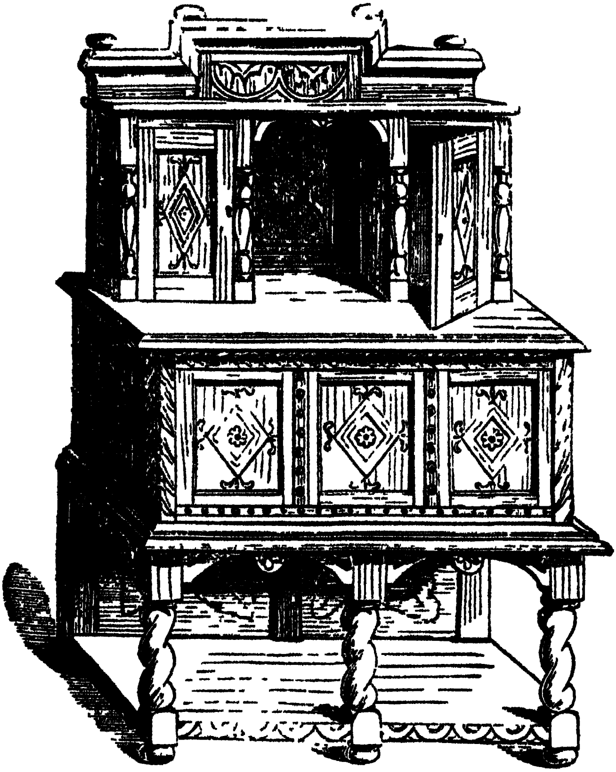
138. With regard to the height of the bracket-table, as it is not a table which any one will sit at, but make use of only in a standing posture, it should be from 32 to 33 inches in height, measuring upwards from the ground. Ordinary table height is 27 inches, but that at which I write myself is 29 inches in height, so "table height" may be said to vary from 27 inches as a minimum to 29 inches as a maximum. Chair height for an ordinary chair is 17 inches, the height being measured from the ground to the upper surface of the top rail of the chair. Chair height is slightly lower for easy and lounging chairs, but slightly higher in music chairs, and stools, to give the performer more power over the keyboard of the piano when playing. The seat of an ordinary chair is level all over, or, in other words, flat, and so are those of music chairs, but seats of easy chairs are slightly lower behind than in front. In all these points the convenience of the sitter is regarded.

Table and chair height.

139. I have mentioned table height and chair height, and given the general dimensions, because I wish to show that it is possible to make for narrow entrances and passages a seat on this bracket principle, on which any one who is compelled to wait awhile in the hall or passage may be asked to sit, while he or she is kept waiting. Such a seat, however, should be very strongly made and put together, for fear of an accident in the collapse of the seat and sitter at any time. I may also take the opportunity to point out here that when the amateur workman has occasion to make small brackets to be let down by fireplaces to hold any small article

Chair seat in hall.

that may be being used by any one who is sitting by the fire in the winter, such as a lamp, candle, tumbler, wineglass, cup and saucer, book or workbox, they are made on the same principle, but very much smaller and lighter than the bracket-table just described. I have mentioned this now to prevent the necessity of again calling the attention of the reader to them when I am describing amateur-made fittings of this kind for sitting-rooms and bedrooms. So at this point I may take my leave of brackets in particular, and fittings and improvements for the entrance or hall in general.



Side-board made of Old Oak Chests.

CHAPTER V.

STAIRCASES, AND MODES AND MEANS OF IMPROVING THEM.

A New Pantry or Store-room—Staircase Obstruction—Staircase Construction—Removal of the Scroll—Well Staircase—Hall Lamp—Difficulties with regard to Lamp—The Difficulty Overcome—The Newel—How it was Made—The Gas Standard—Attachment of the Newel—Winders not Alterable—Classification of Subject Matter—Cupboards on Staircases—An Old House in a Country Town—Arrangement of Hall, Passages and Cellarage—The Staircase and its Parts—Improvements in Staircasing—Arcaded Work—Provision for Lavatory—Hanging Closets for Coats, Hats, etc.—Combined Cupboard and Book Shelves on Staircase—Plan of Landing, etc.—Boards for Sides of Shelves—Grooving Boards—Fixing Standards—Pulling in Screws: Grease Box—Removal of Rusted Screws—Shelves for Bookcase—Setting out Work—Shape of Shelves—Nosing to Shelves—Driving Shelves into Grooves—Treatment of Edges of Standards—Use of Cupboards—Cornice at Top—Cupboard Doors—Construction—Construction Illustrated—Completion of Cupboard Door—Preparation of Panels—Brackets on Staircases—Suggestions for Decorative Work on Staircases.

140. It will be remembered that in speaking of the cellarage with which the ground floor of one of the houses in which I lived was undermined, I took occasion to say that I had taken a very small place, about 5 feet by 5 feet or thereabouts, to which access was previously obtained without the house, within the house, so to speak, by bricking up the original entrance, and making a doorway and door in the hall, by which it could be entered from the hall itself, carrying all water pipes from the main to the cistern above, and from the cistern above to a tap over the sink in the kitchen, *without* the house as far as possible, and thus preventing injury to the dining-room in time of severe frost and fracture of lead pipes by the freezing of water within them. I need not trouble the reader with all that was done in converting this little place into a pantry or store-room, seeing that the operations in question consisted in making a big hole in the wall of the hall,—a solid 9-inch wall, fitting a door to this hole—and making good the sides by the framing of jambs and architrave with brickwork, making a window for lighting and ventilating purposes on the other side opposite the door, and fitting up the interior with shelves. The window was so badly made that the two little sashes rattled like castanets or loose teeth, and when I objected to its remaining in this condition, the master builder—who had worked at his trade under "Poor Old Uncle," and who, as a faithful disciple, evidently did

A new pantry or store-room.

his best to hold him in reverent remembrance by faithful imitation of his very worst ways—explained that he had sought to indulge and encourage one of his apprentices by permitting him to make this window unaided. I begged him on no account to indulge and encourage any of his apprentices again at my expense and to my detriment, and to put the window to rights; but good Mr. Gerribilder left this for me to do, and the consequence was that neither he nor his apprentices ever had another chance of doing a little choice scamping under my roof-tree, which became a grievance to Mr. G., and a thorn in the flesh which sorely irritated him.

Staircase obstruction.

141. Now it so happened that the foot of the staircase was just abreast of the door that gave access to the new and commodious little pantry, which was a great boon to my women-folk, because previously to its conversion from other uses, we had been literally pantryless; but as the handrail ended at the bottom of the stairs in an ugly excrescence technically known as a flat volute scroll with a corresponding extension of the last stair across the passage in the direction of the pantry door, there was about nine inches less gangway than there might have been, and this prompted me to seek for means of reclaiming the lost inches, and giving more room for getting into and out of the pantry, and obtaining access to the garden door, which was situated a few feet further on under these winders, and a semi-landing which constituted the turn in the staircase, by which the first floor was reached. The annexed diagram, exhibited in Fig. 89, will help to show my meaning more clearly to those who are uninitiated in the mysteries of staircase making, or "staircasing" as it is generally called. I had better explain before I proceed any further that in joinery the front part of a stair, or that part of the step which is upright or vertical, is called the "riser," and the flat or horizontal board on which the foot rests in going up or coming downstairs is called the "tread". Thus a staircase consists of a succession of risers and treads, in which each successive riser rests on the inner edge of the tread immediately below it, and supports the outer edge of the tread immediately above it, the edge itself of the tread projecting beyond the riser, and being rounded off so as to form the "nosing" as it is technically called. To improve the appearance of the stairs and to give a more substantial appearance to the treads, a narrow strip of moulding, square in form, with the lower edge of the outer face removed and hollowed

Staircase construction.

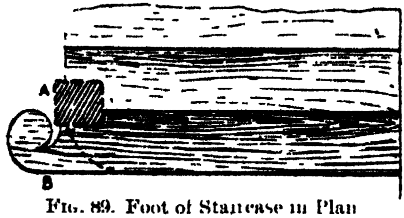


Fig. 89. Foot of Staircase in Plan

out with a moulding plane, is nailed to the riser just below the tread, fitting, in fact, into the right angle that is formed by the meeting of the outer surface of the riser and the under surface of the tread. The ends of the stairs on each side are supported by two boards or pieces of boarding which are called string-pieces or string-boards The string-board on the inside against the wall is left intact throughout, and when fixed to the wall has the appearance of a skirting board. When I say "intact" I mean the reader to understand that it is left of the same width throughout, but it is deeply grooved to receive and support the ends of the treads and risers, which are usually blocked within, that is to say, blocks of wood are set in the angles at the junction of the treads and risers, and the stringing to give additional strength to the structure. Thus it is that the string board against the wall is usually called the notch board. The outer piece is cut so as to receive the outer ends of the treads and risers, the end of the tread projecting beyond the horizontal edge of the triangular piece that is taken out, and the edge of the tread butting against the vertical edge. The projecting edge of the tread is finished underneath with a piece of moulding similar to that put under the nosing. My readers will now be in a position to understand the construction of a staircase; and I trust, with a little thought and care, to make a simple flight in one length for themselves, even without the aid of a diagram.

142. To return to Fig. 89. Just a glance at it will show how I got rid of what I call the "staircase obstruction," and that I did by substituting a newel, shown in plan at A, for the scroll or support for scroll that is shown in plan at B, and as the kitchen door was close to the bottom of the staircase, and the pantry had to be reached by a slightly slanting route, the convenience of the removal of this piece will be at once perceptible. The scroll termination of the lowermost stair is supported on a solid block, shaped and cased with circular work in continuation of the flat part of the tread. This block was ultimately removed, and the opening left in the floor was stopped. The scroll was cut away and the end of the stair rounded off, as shown by the dotted line. Proper support under the new end of the stair was put in from below; this being easy enough, as below this part of the staircase there was a short flight leading to the cellars, and the end was cased in and the moulding carried round in a workmanlike manner. If any of my readers want to carry out the same job, and I strongly recommend it to their attention, I can assure them they will find no difficulty whatever in performing the operation.

Removal of the scroll.

143. But there was much to do before the work of alteration was com-

Well staircase.

menced. My staircase was what is known as a well staircase; that is to say, there was a space, not very wide, it is true, but still a space from which one could look from top to bottom, or *vice versa*; and the form of the well was as shown in Fig. 90. It was, if I may use the expression, a sort of ventilating shaft through the house from ground floor to top, or it would have taken that form if the outer side of the staircase had been entirely enclosed. I hope the reader will be able to gather some idea of the form of the staircase from the diagram given, as I am powerless to give any better assistance to my description, or rather the comprehension of it by these means. The rounded bottom stair and the position of the newel will be easily recognised. The kitchen door was at A, the pantry door was at B, under the landing on which the letter is placed. Then come the stairs and three winders and semi-landing, situated just under the staircase window at C, and then another short flight from the semi-landing to the main landing, with another door, also at B, and above the pantry door. Now I must explain further that the hall was lighted by a gas lamp pendent in the centre, and that, as the hall itself was of low pitch, our hats, if we walked through the hall with them on, very frequently came in contact with the pendent, very much to their detriment. It struck me, however, that if I could attach a pillar lamp to the newel, and do away with the pendent altogether, that the annoyance to which it gave rise would be done away with, and that the pillar lamp would kill a good many birds with one stone by lighting the hall, lighting the pantry, and throwing light through the well of the staircase to the very top of the house. Moreover, the well would admit of the ascent of the air as it became heated, and the lamp would thus be the means of increasing the temperature in the upper part of the house. All which things were effected by the lamp when it was put into position.

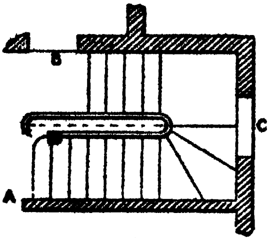


FIG. 90. Well Staircase.

Hall lamp.

Difficulties with regard to lamp.

144. But how to manage this was the immediate question; for had the lamp been placed on the top of the newel as a sort of cap, the air and smoke would have struck against the edge of the ceiling of the staircase just above it, and it would soon have become blackened by the smoke. The lamp to be of real use would have to be just in the dotted line, which forms, so to speak, the axis of the well, and how to get it into this position was the trouble. To have kept the newel in its proper position and to have

placed the lamp on the top of it would, as I have said, have brought the lamp into the wrong place; to have moved the newel to the centre of the well, so as to bring the lamp into its proper position, would have renewed the obstruction objected to in the case of the scroll. And so things came to a dead lock. I tried to get a figure holding an ornamental burner which projected outwards over the right arm and shoulder I was able, indeed, to obtain a suitable bronze figure; but in this and others of its class that I met with, all the lamps went to the left.

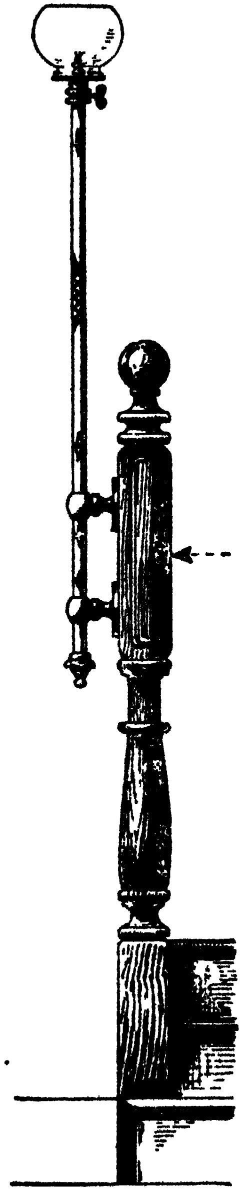


Fig. 91. Newel and Gas Bracket.

145. For some time no fresh light on the subject seemed likely to dawn upon me, and more than once I was afraid I should have to give up all idea of effecting the alteration, and allow things to remain as they were. But I do not like to be beaten, and so I went on thinking, and scheming, until at last, light broke in in the form of a "happy thought," and I was soon able to re-echo in my mind Archimedes' shout of "Eureka," although I did not repeat the extravagances of the Greek philosopher after he had obtained the first inkling of his famous discovery. "It is impossible as far as I know," thought I, "to throw the lamp outwards from the top of the proposed newel, but what if I put it in the form of a bracket issuing from the outer face of the newel?" But here again there was a difficulty, for no lamp could be found in the pattern books that would meet the exigencies of the case: there was nothing long enough to meet my want, and, in meeting it, to carry the light high enough. The thing to be done now was to decide on the shape of the lamp, its attachment to the newel, and the means of providing for access of gas to the burner, without visible means of communication; but even these were soon overcome.

The difficulty overcome

146. I was well aware that it was possible to pierce any newel from base to top, and thus obtain the means of passing a

The newel.

How it was made

"compo" pipe up the boring thus made, and that then it only remained to connect the pipe and the gas standard by an elbow. I first consulted my gasfitter and showed him my idea on paper. He said he could carry it out; so after drawing my newel to scale,—both newel and gas standard are shown in Fig. 91,—I took the first opportunity of paying a visit to Curtain Road, Finsbury, London, E.C., where turners congregate, and where it is possible for the amateur to get anything that he wants in the way of turned work, from a spindle upwards. According to the "Post Office Guide," the right address is Curtain Road, Shoreditch, E.C.; but I have said Finsbury, because it is easier for any amateur wood worker who wishes to visit this classic locality, to make his way from the Bank, along Moorgate Street to Finsbury Square, and then to work to the right, until he reaches his destination. I found a turner, and soon arranged for the newel, which was turned for me in Austrian oak, and supplied properly bored, material and all, for 12s. The ball on the top of the newel was removable, and fitted into the hole bored throughout its length. I daresay many of my readers will raise an objection to the length and heavy appearance of that part of the newel to which the gas standard is attached; but it must be borne in mind that this was unavoidable or very nearly so, on account of the purpose it was intended to serve. I had its general appearance lightened and modified as much as possible by having recessed panels worked out on three of the four faces It may be urged that the designs could have been modified by turned work between the points of attachment of the gas standard but this could not be carried out, through the necessity of attaching the handrail to the newel at the back, just where the arrow head is pointing.

The gas standard.

147. The shaft of the gas standard consisted of a piece of inch piping iron piping, of course. It was finished with a brass ornamental knob at the bottom, and fitted with a brass collar and proper carriage for the glass globe at the top. There was, moreover, a burner tap, and all that is necessary for the top of a gas standard The standard itself passed through two brass sockets, which proceeded, as shown in the illustration, from plates that were screwed to the newel. It was through the lower socket that the elbow passed, by means of which the gas was introduced into the standard to pass upwards to the burner. A hole had to be cut in the face of the newel to admit of the passage of the elbow; but when the elbow was snugly ensconsed in its new quarters, the hole by which it had entered them was plugged up with a piece of the same stuff which had been taken from the bottom of the newel. The standard was painted to match the prevailing colour in the stair-

case paper, and ornamented with rings of white, relieved with scarlet, long rays of the same colours proceeding from the rings and terminating in tiny circlets of colour. Four rays only, pyramidal in form, proceeded from the rings; for this was all that the surface of the standard would permit. Altogether, when finished, it presented a quaint and pretty appearance, and from its novelty drew the attention of all who came to the house. The lamp glass and burner were brought precisely into the central line denoting the middle axis of the well in Fig. 90. When lighted, the light was thrown throughout the hall into the pantry, and right up through the house, just as I had anticipated; and the general result was satisfactory in the extreme.

Attachment of the newel.

148. The newel, as will be understood from the plan in Fig. 91, was recessed into the second stair, and carried down through the floor of the passage into the cellar below, where the foot was properly secured and blocked in. The heads were slightly notched into it The newel itself was turned out of a piece of oak, 4½ inches square, so that it was very massive, and afforded ample room for attachment. Of course, it had the appearance of having been cut in such a way as to rest on the top of the second stair, and to be secured to the riser and string board by pieces at the side, which had been left for the purpose when the inner part had been cut away: but this was in appearance only: in reality, it went down solid, and was as firm as a rock and as strong as a castle. The handrail was tenoned into it, and when everything was completed, the newel itself and the handrail were French polished. The old scroll in which the handrail previously terminated had been supported by a cast-iron ornamental standard, round which were grouped four or five balusters, or bannisters, some of which were of iron, with pieces at top and bottom turned to them at right angles at the foot, and at an angle at the top greater than a right angle, and in accordance with the slope of the handrail when this was necessary. These parts were kept to be devoted to other uses when occasion served.

Winders not alterable.

149. This was the most important, and indeed the only, alteration I ever attempted and carried out in a staircase, and it will be found to be the only thing an amateur workman can. Staircases, indeed, are finished in this way in many new houses. Having a strong aversion to winders on account of the trouble they give when carpets are put down, I tried to see if I could do away with those shown in Fig. 90, and convert the first winder into a landing, putting a couple of straight stairs, one on each side of the nosing of the semi-landing, shown by the straight line c. I consulted a thoroughly competent staircase hand as to the feasibility of the proceeding:

and he soon proved to my entire satisfaction that it was impossible to do as I desired, owing to the construction of the stairs, and the inevitable consequence of destroying the ceiling immediately under the stairs, if I attempted it; so I was obliged to put up with the winders as heretofore.

150. I am always impressed myself with the desirability of splitting up the subject on which one writes in such a manner that one part may be exhaustively dealt with in one chapter, and another in another, and so on; in other words, to resort to orderly arrangement and classification as far as possible; but it often occurs that in divisions of any particular subject, one will frequently overlap another, and that certain parts which may be treated suitably enough in one division may be dealt with more conveniently in another. I will endeavour to make my meaning more clear by taking a point or two in connection with staircases, and handling them in connection with this. The flight of stairs or steps which leads from the ground floor to the basement or cellars, as the case may be, although it may be regarded as *a* staircase, is no part of *the* staircase, which, according to my view of things, consists of the flight or flights of stairs which commence on the ground floor, and give access in an upward direction to the first floor and upper floors of the house, if there be anything above the first floor. It may have been noticed that I have said nothing about doors in halls or passages put up to cut off one part from another with the view of preventing draughts, perhaps, or as a convenient screen. I have done this because it will be more convenient to treat such doors in the chapter devoted to doors collectively; and so this with the staircase. The opportunities of making cupboards thereon are but very limited; and so, perhaps, it will be better to deal with these at once, instead of leaving them for the chapter on cupboards; and for this reason, that anything in the form of a cupboard on the stairs is external, as far as the rooms of the house are concerned, that is to say, within the rooms themselves; but that cupboards proper, in the usual acceptation of the term, are those enclosed spaces that are found within them. So, although I postponed the consideration of doors in or *across* halls and passages for the reason given above, I will anticipate in this chapter the treatment of cupboards just so far as the staircase is concerned. I will therefore proceed in this chapter to consider cupboards and bookshelves on stairs, which are intimately and closely connected one with another, and close by saying a few words about brackets on stairs.

Classification of subject matter.

Cupboards on staircases.

151. Now, if there be a basement to a house in which the kitchen and offices and frequently a morning-room are located, access to this part will be

An old house in a country town.

generally obtained by a flight of stairs situated *under* the flight which affords access to the first floor, and the triangular opening between the horizontal floor and the slanting string-board, as generally cased in with panelling, and a door is fitted in at the head of the stairs. If there be no basement but cellarage only, and there is access to the cellars from another part of the ground floor, the space under the stairs is as a rule cased in with panelling and formed into a cupboard. For my part, I cannot see why there should not be a hall lavatory under the stairs where height permits; and I will cite a case in point, and try to show how this may be managed. In a house which was occupied by my father in a town in the West of England, and in which we lived for some years when I was a boy, there was an arrangement of the kind alluded to above, and the disposition of the ground floor was as shown in Fig. 92. It is only a diagram sketched in accordance with my recollection of the place, and is in no way duly proportioned to scale. It is necessary to proceed on lines very nearly allied to hypothesis at times, and this is a case in point, given because the suggestion to follow may happily suit somebody and somebody's dwelling. In this A represents the hall, which was of considerable size; indeed, long enough and wide enough in the house itself to admit of a long dining-table being placed in it, on which supper has been laid for many guests at an evening gathering. The front door was at B, and doors by which two rooms of good size, separated by folding doors, were entered, were at C and D; E was a short and dark bit of passage with a door at F, which gave access to a high closet under the stairs, as dark as Erebus, because utterly without light, save the little that found its way through the doorway when the door was opened; and musty in the extreme, because utterly without ventilation. Through the opening G, which, of course, was doorless, entrance was obtained to a passage H, at one end of which was the back door K, entered from a flagged court without, with another door at the end, slightly recessed from the front of the house, and another at L, which led into the garden; M was the kitchen door, to the left of which was the scullery, with a window that looked into the small court already mentioned. At N was the entrance to a flight of stone stairs, which led by winders first, and then by a short flight in the same position as the flight at F, to a stone-paved vestibule which gave access to a wash-house and large coal cellar under the parlours, and a commodious wine and cider cellar towards B. In this vestibule was an excellent pump.

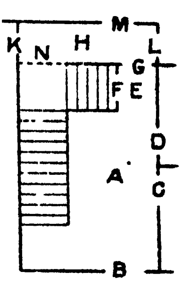


Fig 92. Sketch Plan of Ground Floor.

152. We now come to the staircase. The first flight led to a landing on which was a staircase window to the left and a door at x. It must be remembered that this is a *multum in parvo* plan, and that I am compelled to indicate parts in the realms above in this case by letters that I have already used for parts of the realms below. From this landing, a short flight over the dark and musty closet,--in which memory now tells me a small white chest of drawers containing various tools was kept, which led to a short corridor above, which gave access to four bedrooms, and a flight of stairs leading to an attic. The space under the first flight of stairs was closed in with panels, and there was a door under the highest part, through which entrance was obtained to a dark and inconvenient closet, in which was kept a quantity of old and valuable china, and other things but seldom used. At the head of the first flight the door at x gave access to a very small apartment to which no further allusion need be made, and which was situated over the left-hand portion of the passage that led by the kitchen from the back door to the garden door. Midway over H was a store closet, in the upper regions of which, under the roof, was a huge rain water cistern, entered —I mean the store closet and not the cistern from that part of the corridor which lay over the right end of the passage H, and which led to a bedroom over the kitchen. The store closet was as dark as that which was under the stairs at F, as I realised whenever I found the door unlocked and made predatory incursions therein in search of raisins, a dried fruit of which I was, and am, and shall be, inordinately fond, although not from the late Sir William Gull's point of view : and candles, for surreptitious reading in bed at night, when I was supposed to be sleeping the sleep of the just. Much was dark and inconvenient that might have been light and cheerful ; but even as there were "giants in the earth" in olden times, so there are architects in the earth in times present, who, like the giants, do things that they would have abstained from doing, had they given themselves to reflection and yielded to the chastening influence of common sense.

The staircase and its parts.

153. And now let me attain the point at which I have been seeking to arrive through the devious ways of preliminary explanation. When the casing between the floor and string-board of the stairs leading upwards from the ground floor merely serves as a mask to the staircase leading to the basement, and as a protection and safeguard from falling thereonto, why should not the panels set in the framing be of fluted or hammered glass—rolled glass is, I believe, the correct term ; but it has the appearance of having been hammered, and so I use the word, although to

Improvements in staircasing.

Arcaded work.

hammer glass is a thing impracticable – instead of wood? and why should not the work be arcaded, that is to say, the framing in long and narrow panels with circular heads, rising in height one above another, until the utmost limit was reached? Secondly, if the triangular space under the stairs be of necessity devoted to cupboard room, why should there not be a succession of small cupboards, as indicated in Fig. 93, with arcaded panels to the doors, which when opened would disclose and give easy access to the whole of the space within, instead of a single door at the highest part, leaving the remainder of the space within in semi-darkness if not total eclipse, and extremely difficult of access! Of course, the reader will understand that it is intended to have boarding between each cupboard, running in each case from the upright between each door and the door next to it, to the wall of the house. If I was living in a house that was cased in in the ordinary way, and that house was my own, so that I could please myself as to what I would do and what I would not do within it, I should certainly remodel any cupboard under the stairs on the ground floor precisely on the lines laid down. Here, however, is a good and feasible suggestion to amateurs who own their own houses for home carpentry.

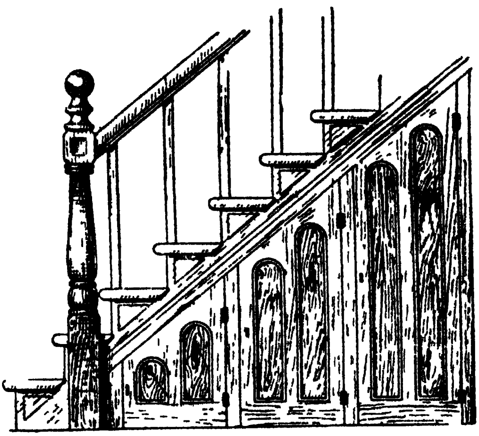


FIG. 93 Succession of Cupboards under Stairs.

Provision for lavatory.

154. Lastly, let us take the case of the dark and musty closet below the flight of stairs from the landing to the corridor in Fig. 92. If the panels or partition walling that formed the return from the casing under the stairs in the direction of the passage E, had been in the one case glazed, and if divided from the hall by a brick nogging partition, had had glazed panelling substituted for the partition so as to admit light to the closet, it would have been good, and the closet might still have been devoted to the purpose for which it was used. It would, however, have been better if the closet had been turned into a lavatory or a hanging closet for coats and hats; and I will mention two ways in which this may be done. If it be thought better to have a lavatory, I should remove the door at F,—I am now referring to Fig. 92, and retain the glazed panelling by which the closet is

separated from the hall, or substitute glazed panelling for any other kind of partition that might be there. I should then put up pilasters at the sides on the jambs of the door, and throw a circular arch over the opening, filling the space above with match boarding, or boarding grooved and tongued together and mocked with moulding, so as to form two panels with rectangular corners, one to the right and the other to the left resting on arcs, which would in reality be quadrants of a circle below From this panelling or boarding I should let depend two curtains as shown in Fig. 94, which could be brought together at pleasure, and in the recess thus formed I should place a shelf with cupboard doors in front, and with a basin fitted with a removable plug to let the water run away when used for washing hands, etc., with a tap above it. If a supply both of hot and cold water could be managed, so much the better. A gas burner or petroleum lamp, according to circumstances, should be placed above the tap, and if a petroleum lamp it must of course be put on a bracket.

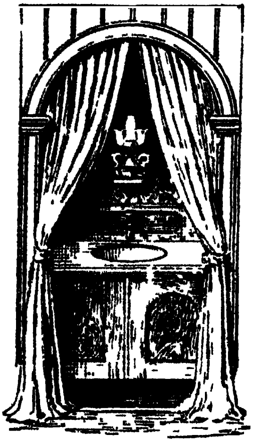


FIG. 94 Arched Entrance to Lavatory

155. The arrangement described above would look both pretty and effective, although it may be urged that it would be out of sight and lost to view from the hall. True; but "Whatsoever thy hand findeth to do, do it with thy might"; that is to say, to the very best of brain power and hand power, the one to conceive and the other to execute. Suppose that there had been no basement, and therefore an available space under the landing at N, approached from the hall under the short flight of stairs leading to the corridor at F in Fig. 92, and that the square-topped recess under the landing had been high enough, as doubtless it would have been, to convert into a lavatory or hanging closet for coats, etc. Then it would have been thought worth while to bestow care on the construction and to make it look as attractive as possible; and if so in this case, why not in the other? Supposing, however, it had been determined under the existing state of things, shown in Fig. 92, I should have closed the opening at F, removed the partition or panelling looking towards the hall, and substituted the arched arrangement with curtains shown in Fig. 94; but, as a matter of course, without the basin and conveniences for washing. I should have done this because it would be more convenient for access from the hall, and I should have had three sides on which to put up hat and coat rails. The curtains

Hanging closets for coats, hats, etc.

would, as a rule, remain closed to intercept dust, or closed when sweeping and cleansing was going on in the hall, and withdrawn to the sides at other times. I do not describe the mode of making pilasters here, because something will be said on this point further on.

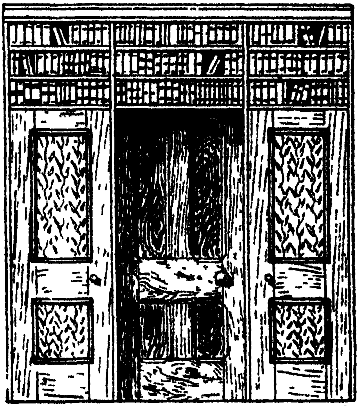


FIG. 95. Combined Bookshelves and Cupboards on Staircase—Elevation.

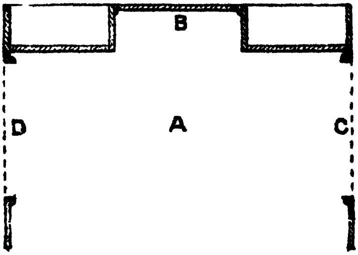


FIG. 96. Combined Bookshelves and Cupboards on Staircase—Plan.

156. I am not an advocate of placing bookshelves in halls, even if there were convenient opportunities for doing so, because I consider it would be merely placing books in harm's way—"tempting Providence," as the phrase runs—the Providence in this case being surreptitious borrowers *pro tem.*, and possibly appropriators; but if one has an overflow of books that cannot be conveniently disposed of elsewhere, I do not see quite so much objection to placing them on the staircase on the first or second floor; and I will give a case in point in which this might have been done had the doors of the rooms been rightly placed. Two out of the three contiguous doors were conveniently situated for the work; but the third was not, and this put an effectual stop to operations in this direction. However, there may be many a house in which the doors are as they should be for this kind of work, and so I will show how this may be done. If it be merely sought to make an overdoor bookcase, all that is necessary is to screw boards about 6 inches in width, and nicely planed up on the mouldings on each side of the framing of the door, reaching from the bottom of the door or the floor to ceiling or cornice; and if there be a cornice the boards should be cut to fit. The parts of the boards within and above the door should be slightly grooved to receive the ends of the shelves, the lowest of which would rest on and be secured by screws passed down from within to the moulding. When the other shelves have been put in place they should be fixed, preferably by screws, and a moulding attached to the side boards in front and returned to the wall or cornice, as the case may be. The overdoor bookshelves thus made would then present the appearance of the central compartment of the bookshelves,

Combined cupboard and book-shelves on staircase.

shown in Fig. 95. The work is so simple that it does not need a separate diagram; and what I shall have to say with respect to the combined bookshelves and cupboards will apply also to these. I cannot describe and give diagrams for everything I mention: if I did so, the proportions of this book would expand to an enormous folio, and we are told by some men of old that "a great book is a great evil".

Plan of landing, etc.

157. The plan of the combined bookshelves and cupboards on staircase is shown in Fig. 96, in which A is a wide landing from the turned flight of stairs, as shown in Fig. 90, giving access to three bedrooms and a dressing-room. The door leading into the dressing-room is at B, and those leading into the rooms on either side of the dressing room are at C and D. The door of the fourth room was close to that at D. I must proceed now on the hypothesis that the doors at C and D are equidistant from the party wall of the dressing-room, say about 12 inches from the party wall itself; and here I must take compassion on the neophyte, and give him a little help by diagram, which will help him in putting up overdoor bookshelves, either singly or in combination. One of the boards necessary for the sides of the bookshelves and cupboards is shown in Fig. 97. This has been drawn on a scale of ½-inch to the foot, and on the supposition that the height of the doors, including framing and mouldings, is 6 feet 9 inches. At this height, therefore, take the square, supposing that the front edge of the board has been shot truly, and draw a straight line with the square. We will further suppose the boards to be what are known as inch-boards, and that they have been reduced by planing to a thickness of ⅞ inch. Further let us suppose that we have taken boards 10 feet in length, and have started our measurements from a line drawn with the square near one end which we will call the lower end of the board. For the shelves themselves, thinner boards will do: and we will suppose that we have taken ¾-inch boards that have been reduced to ⅝ inch by planing. For the sake of giving as much depth as we can to the cupboards without jointing the boards to make them wider, we will suppose the width to be 11 inches. As the shelves are to be ⅝-inch in thickness, we mark out by a line drawn with the square, parallel to the line first drawn, another line at the

Boards for sides of shelves.

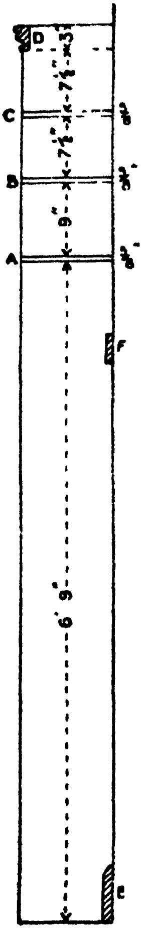


FIG. 97. Side Elevation of Board for Sides of Bookshelves

distance of ⅝-inch *bare* from it; the word *bare* implying that it is a hair's breadth or so less than ⅝ inch, so that the ends of the shelves may fit in tightly when placed in position. As the height of the ceiling is only 9 feet 6 inches or a trifle less from the floor, and there is no cornice, we find that we have room for three shelves, well calculated for the reception of the smaller sizes of books; and so we measure off a distance of 9 inches from the line indicating the top of the first groove. Here we draw another line at right angles to the edge of the board with the aid of the square, and mark out another groove, ⅝-inch bare. Then a distance of 7½ inches, and another marking for a groove ⅝-inch bare: a third distance of 7½ inches, and 2 inches beyond this brings us to the utmost length we can fairly allow foi the board, as there may be inequalities in the ceiling and even in the height of the wall itself, plasterer's work being seldom exactly true.

158. A saw kerf with a well-sharpened saw, or, better, a deep cut with the point of a powerful knife blade, drawn along the edge of the square or a steel rule, is then made along the lines drawn to define each groove, and the grooves themselves are worked out with a sharp ½-inch chisel, first to nearly the depth required, and then finished with a router. The router may be gauged to the depth of ⅛ inch, which will be sufficient for the central boards of the combined structure. The end boards, however, and boards for the side of an overdoor bookcase, may be taken to the depth of $\frac{3}{16}$ inch, or even ¼ inch, as the standards are ⅞ inch in thickness. When the grooving has been done, the upper outer corner of the board, as shown at D, should be slightly recessed to take a moulding of the depth of 3 inches, a good bold moulding being necessary for a finish at the top of the bookshelves. In the case of a simple overdoor bookcase, the moulding should be returned along the outer surface of the top of the boards, and the boards themselves, for this sort of bookcase need be no more than 5½ inches in width, which will allow of the standards being made of an 11-inch board ripped down the centre. The reason why the grooves in the central standards are restricted to ⅛ inch in depth is because they must be grooved on both sides. In the end standards they may be taken out to the depth of ¼ inch. The four standards for the combination should be finished first, and great care should be taken to keep the measurements and the grooving in each board exact and true, so that the shelves when put in place may be both level and parallel. We have now completed the preparation of the two standards required for the simple overdoor bookcase, and the four standards necessary for the combination of the bookshelves and cupboards: and these

Grooving boards.

may be laid aside while we proceed to make fresh measurements and decide the length of the shelves. I have said nothing about a working drawing to scale of the whole structure, but this the amateur workman should make on a scale of 1½ inches to 1 foot.

Fixing standards.

159. Now for a little more supposition. We will take it that we are putting up these cupboard bookshelves on a landing that is 6 feet in width, for this was the actual width of the landing that I have in my mind, which was very nearly, if not quite, suitable for the job we have in hand, and would have been the very thing if the door of the room on the left-hand side had been exactly opposite that on the right. The standards may now be considered as ready, and it will help us and get them out of the way if we proceed to fix them. To do this, the lower right-hand corner of the central standards must be recessed to ensure its fitting over the skirting, and permitting the inner edge of each board to butt as firmly against the wall as the plastering will allow. This done, the boards may be at once screwed firmly to the moulding round the door. With regard to the standards against the wall at each end of the structure, it must be remembered that, although the lower end of each board will butt firmly against the skirting, the prominence of the skirting will prevent it from butting against the wall, and that blocks of the thickness of the skirting must be screwed on to the outer surface of each standard the surface, namely, which faces the wall. If the skirting be an inch in thickness, the blocks must also be an inch thick. Having prepared four blocks, 11 inches long by 2 inches in width and 1 inch in thickness, screw one to the top of the board at D and another at A, the top of the block being on a level with the *lower edge* of the groove at A. It must not be coincident with the groove, overlapping it to an equal distance above and below; for if this were done, the points of the screws, unless carefully chosen of the right length, might project in the groove itself, and be in the way when the shelf is driven in. If 1½-inch screws were used it would be all right, but even with these the countersinking to receive the head of the screw must not be too deep. Countersinking is usually done by the professional workman with a couple of semi circular scoops with the point of a chisel. It is better to do it with a gouge, but, best of all, with a rose bit, which, for small screws, I use in a pad, and for large screws in a brace.

Putting in screws: grease box.

160. Just a word or two about putting in screws now we are on the subject. Firstly, *never* put the end of a screw in your mouth, for they contract rust quickly enough without this, and a screw that is rusted into the wood is always difficult to withdraw. *Always* dip

the end of a screw in grease, in the second place, before turning it into the wood, for it is thereby prevented from rusting and is easy to withdraw. Thirdly, always keep some grease by you when you are at work for greasing screws, saws and other tools that work all the easier for a little lubrication. In Fig. 98 I give a sketch of my grease box, and I recommend every amateur workman to provide himself with a similar one. First, take a block of wood about 3¼ inches by 2½ inches by 2 inches in depth, and plane the top true: then take another piece of the same dimensions as regards length and breadth and ½ inch thick. Plane up the inside surface, and after putting it on the other, screw them together with a mushroom-headed screw, on which the cover should turn not too easily to the right or left. Then prevent the lid from moving by putting in a wire nail in front, and shape the whole box as shown, cutting off the shoulders at the screwed end with a tenon saw, and shaping and finishing up with a rasp. Lastly, remove the lid and scoop out a hollow in the block with a gouge, put the lid in place again, fill the hollow with grease, and it is then ready for use All these home-made aids to carpentry and joinery are easily made and very useful. The hollowing out will be done all the more easily if the block be held tightly in the bench vice while the work is being done. In case the amateur gets hold of an obstinate screw at any time, he may rely upon it that the obstinacy is occasionally rust or a worn head: if the latter, deepen the nick with a narrow and thin cold chisel, as the enlargement and deepening of the nick will enable the turnscrew to get a better purchase on the head of the screw; if the former, take a red-hot piece of iron and hold it when at red heat to the head of the screw. By this means the screw will be loosened sufficiently to submit to the pressure of the turnscrew. I suppose the action of the heat causes the screw to expand, as all metals are subject to expansion under the influence of heat: when the hot iron is withdrawn, the screw returns to its former shape by contraction. The wood, however, has been driven out very slightly by the influence of the metal within and around it, and the withdrawl of the screw is now all the easier because of the loosening of the grip of the matter in which it was embodied.

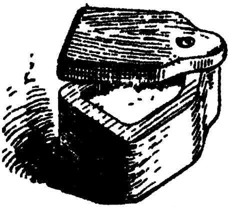


FIG. 98. Grease-box

Removal of rusted screws.

161. To return, however, to the standards, which, I hope, have now been blocked at the upper end, the lower ends of the end uprights may now be screwed as closely as may be to the skirting, and we will now proceed with the shelving. The first step in doing this is to calcu-

Shelves for bookcase.

Setting out work.

late exactly the length of the shelves. To do this in the easiest way let us set the work out on a slip on a scale of ½ inch to a foot. The extreme width of the landing from wall to wall is 6 feet, as already stated; and we will suppose the width of the dressing-room door, including framing, to be 2 feet 10 inches. Having taken our slip of wood, and run the plane over it to remove any marks that may have been previously made on it, we take a point in a straight line drawn along the centre of the wood, as at A in Fig. 99. From this point we measure off 1 foot 5 inches on each side, and this gives us the width of the door and framing; then we take ⅞-inch at B and C for width of central standards, and mark the limits of each member of the structure that we are setting out with the square, the edge of the slip having previously been planed up true. From A we measure 3 feet in each direction, which gives us the exact width of the landing on the slip. We then take F equal to 1 inch, and G equal to 1 inch inwards towards A, and D and E next to them, each equal to ⅞ inch. Now, as the grooving in the sides of the central standards is ⅛ inch deep on each side, we know that the length of the shelves in the central compartment must be 2 feet 10¼ inches cut *full* *full* being in contradistinction to *bare*, and meaning just a shade over the exact length. This is done in order that the whole may jam up tight together when the shelves are driven in. To find the length of the shelves in the side compartments over the cupboards, add to 2 feet 11¾ inches (width of door + width of central standards) 3¾ inches (width of blocks and end standards), which gives a total of 3 feet 3½ inches. Subtract this from 6 feet, which gives a remainder of 2 feet 8½ inches. Divide this remainder by 2, which gives 1 foot 4¼ inches for the length of each of the side shelves; but to this must be added the depth of the grooving in central and end standards, namely, ¼ inch + ⅛ inch or ⅜ inch, and thus the entire length is 1 foot 4⅝ inches, which, like the central shelves, must be cut *full*.

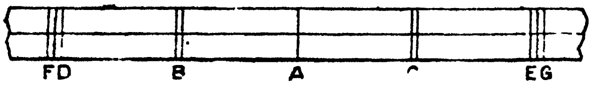


FIG. 99. Example of Setting out Work on Slip.

Shape of shelves.

162. As a matter of course the width of the shelves at B and C will be 11 inches, and this will bring them *flush* or even with the front edge of the standards; but the width of the shelves at A must be slightly increased for reasons that will appear presently. The extra width is obtained by nailing a slip of the width required to the hinder edge of the shelf; but in our case we will suppose that the shelves have been cut to the proper width beforehand, and we will do what is wanted in a different way.

Our object is to get a nosing to the shelves that will project beyond the face of the standards: and had the additional piece been put on at the back, as in Fig. 100, we should have cut the board first of all of greater length than the actual length required for the shelves, and carefully reduced the wood to the proper length by taking out pieces, as denoted by the shaded part at A, and leaving a projecting horn at B. These horns would have to be cut with precision by a tenon saw a fine dovetail saw would be the best for the purpose, so as to be halved over the standards. This, of course, would be the only and orthodox way if we wanted to draw the shelves out; but we do not wish to do this, and so we will take other means of accomplishing our object. We will suppose now that the standards have been put in position and screwed to their supports, as already said; and we will further suppose that the shelves have been driven in, first those in the side compartments and then those in the central space. If this has been properly done, the structure will be found to be very rigid and unyielding as it ought to be. By the way, when driving a shelf into grooves, do not hit the edge with a hammer, which will inevitably bruise it, but lay a piece of wood of tolerable thickness against the edge, and then strike this piece of wood with a mallet. Wood should always be struck with wood, and iron with iron. And now for the nosing. Take a piece of wood, of the same thickness as the shelves, and 6 feet long, and plane up accurately on the inner edge. In order to obtain a bold nosing, this wood should be 1¼ inches broad. It will plane down to about 1⅛ inch. Bore holes through it carefully, and countersink for heads of screws; about six holes will be sufficient, and screw on with thin screws 2 inches in length. Mark the shelves at the places where the screws enter, so that in case it is desired to take the structure down, the spots where the holes entered by the screws have been stopped may be easily found, the stopping removed, and the screws withdrawn.

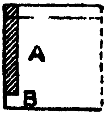


FIG. 100. End of Shelf.

Nosing to shelves.

Driving shelves into grooves.

Treatment of edges of standards.

163. In order to hide the grooving into which the shelves have been driven, the edges of the standards may be covered in with a thin slip of wood of the same width, beaded on each edge, and the edges of the shelves may be beaded before being driven in, unless it be intended to nail leather along the edge to keep dust from settling on the tops of the books. If the workman has the time and skill, it affords a nice finish if the standards and shelves throughout are edged with mahogany about 1 inch in width. The edging should be glued and bradded on, and the sides run over with a plane, to bring both deal and mahogany edge to a uniform thickness.

I mention these things because I am now endeavouring to give the amateur workman a lesson in carpentry, or rather joinery, which will be useful to him, and which need not be repeated at any future time with reference to work to be described in pages to follow. And, having got so far, we must now turn our attention to the cupboard doors, after saying that it is as well to put a piece of wood, 1 inch in thickness, on the floor *between* the standards that form the sides of the cupboards, with a nosing as wide as the nosing above, over which the cupboard doors will work easily. These pieces should be furnished with horns as shown in Fig. 101, to lap over and butt against the standards. These horns should be rounded at the outer corners.

Use of cupboards.

Cornice at top.

164. As yet no intimation has been given of the purpose to which it is proposed to put these cupboards, so it will be as well to intimate now that they are intended for the reception of garments, either masculine or feminine, that is to say, for dresses or for cloth clothes. Therefore a rail must be jammed in between the standards of each cupboard. Four on the rails and one in the centre of each standard will be found to be sufficient. The rails should be about 9 inches from the top of the cupboard, $2\frac{1}{2}$ or 3 inches in width, and not less than $\frac{1}{2}$ inch in thickness. The inner edges of the standards may be recessed to receive the rails, which need not be nailed or screwed in, but merely jammed in. If put in in this way they will need no fastening or any other support, for they cannot, under any possibility, drop out of place. Further, the moulding serving as cornice at top may now be dropped into the recesses made for it, and screwed on with light thin screws.

Cupboard doors.

165. At last we have arrived at the cupboard doors, and in Fig. 101 I have given the elevation of one of them on a scale of $\frac{1}{2}$ inch to 1 foot. The door of the dressing-room was 6 feet 9 inches in height, but we put a bottom board 1 inch in thickness between the standards, for the door to work over, clear of the floor; so our cupboard doors will be 6 feet 8 inches in height. These doors are to be panelled doors; and the skilled professional and skilful amateur would make them in the usual way, that is to say, he would cut out and plane up his styles or uprights for the door and rabbet them, and then do the same with the rails or horizontal pieces and tenon the rails into the styles; but the unskilled home carpenter is not in a position to tackle such a job as this, and so I must show him an easier, though not so strong, a way of arriving at the same end, by making styles and rails with two thicknesses of wood screwed together. And as we wish to make inch doors, we must cut the pieces of which we are going to make our

rails and styles out of ½-inch board. Looking at the front elevation of the door in Fig. 101, let me say that the outer part of the styles and the top rail are 2 inches in width, and that the central and lower rails are 6 inches in width. Therefore, to get or rebate ½-inch square we must make the inner part of our styles and top rail 1½ inches in width, and the inner part of the central and lower rails 5 inches and 5½ inches in width, respectively. The reason for the difference in the width of the central and lower inner rails is that the central rail requires the rabbet on both sides, and the lower rail only at the top. Let the amateur workman again put the work on paper on a scale of 1½ inches to the foot, and everything will become clear to him. The first thing to be done is to lay the *outer* part of the styles on the bench, having cut them 2 or 3 inches longer than the length they should be. Draw pencil lines across them with the square at the proper length, as guide lines in putting on the *inner* part of the styles. Cut these also a bit longer than the length they will be, namely, 1 foot 4¼ inches; and with the square draw guide lines in pencil on the inside face, accurately defining their length. Having got them into position, screw the rails to the styles with ¾-inch screws deeply countersunk. We have now got the frame partly put together in *quasi* halved jointing, and we have only to fill in the other pieces to make the frame complete.

Construction.

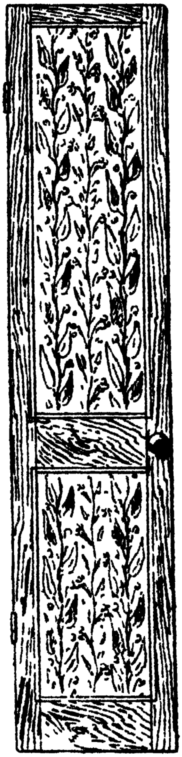


Fig 101 Front Elevation of Cupboard Door

166. I have endeavoured to make this procedure as intelligible as I can in Fig. 102 by illustration as well as description. In the different parts of this diagram, A shows the *outer broader* part of the style, and B the *inner narrower* part of the rail; C shows the *inner narrower* part of the style, and D the *outer broader* part of the rail. No. 1 shows the jointing of the lower right-hand corner of the door in elevation; No. 2, elevation of edge of door to right; No. 3, plan of edge of door at bottom; No. 4, a perspective view of the corner. We had got so far as the screwing together of the *outer* styles and *inner* rails. Now, having some stuff 1½ inches wide and ½ inch thick, ready cut and planed up, let us first fill up the inner part of the door with pieces from this stuff, and so put in pieces flush with the *outer* edges of the work already put together as follows:—Two shorter pieces on the styles from

Construction illustrated.

Completion of cupboard door

bottom rail to central rail, and two longer pieces from central rail to top rail. Cut these full, and jam them in tightly, knocking them down at the points of contact with a mallet, a piece of wood intervening between wood to be knocked in and mallet with which the blow is given. Screw these four pieces tightly down, and then turn the frame round on its back. Then complete the face by putting on the broader parts of the rails flush with the outer edge at the top and bottom, but the outer face of the central rail which is 6 inches wide, overlapping the narrower and inner part by ½ inch at top and bottom. All the parts thus let in should be cut full. We have now a solid and substantial frame, with a ½ inch rabbet round each panel on the inner side. While the face of the door is uppermost, run a bead round the inner edges of the four panels with a beading plane as far as it will go, a router, a beader, or even a screw, as already described

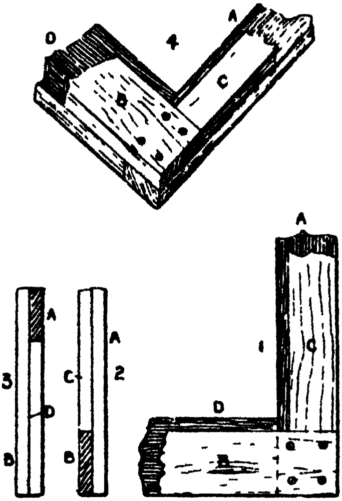


FIG. 102 Construction of Framed Cupboard Doors.

Preparation of panels.

167. But the panels have yet to be made, and for these a framing of ½-inch stuff 1½ inches wide should be made to fit into the framing of the door with ease. Over these frames stretch some pretty cretonne or other suitable material, and nail it round the edge of the frame with tacks, drawing a piece of tape along the edge as you proceed over the material chosen. Trim off the cretonne flush with the edge of the frame, and then put the frames in their places. They will now fit in tightly. Secure them with a brad or two in each side, put in skew-wise, that is to say, at an angle to the surface into which the brad is driven, instead of upright. All that now has to be done is to put on a handle a handle supplied for cupboard doors with a straight piece of metal keyed on to the squared end of the spill which serves as a button and fastens into a nick cut in the standard to receive it. Then the door must be fitted with butt hinges, and hung to the end standard. Before the panels are put in the woodwork, that is to say, the framing of the door, the nosing of the pieces at the foot of the cupboard, the nosing of the shelves immediately above the cupboards and door, the

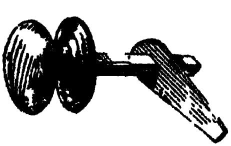


FIG. 103. Handle for Cupboard Door.

cornice and the edges of the shelves, with an inch or two of the interior should be stained and varnished and otherwise treated to meet the fancy of the maker.

168. Brackets on staircases are the last things I have to touch on in this chapter. Wherever there is a corner or a space between doors that can be suitably fitted and filled with one of these, do not hesitate to put one. They are always useful for setting down jugs, candlesticks, lamps, and any of the various smaller things that are constantly being carried into or out of bedrooms. They must be made to suit the position, and of such shape as the home carpenter may find or think best. If in a corner, a couple of ledges will be found to be a suitable lodgment. The ledges should be 1 inch or 1¼ inches in thickness, and the brackets should be secured to them and on them by screws put in skew-wise from above. Sometimes in a tolerably large corner a succession of bracket shelves, each smaller than the one below it, has a very pretty effect; but the brackets must all be of the same pattern. When a bracket is put on to a space between doors, it may be made to lift up and down or fixed in position. If fixed in position, it should not be of too great a width, and the pattern may be part of the superficies of a circle, greater than a semi-circle, or, at all events, semi-circular. I give in Fig. 104 a pretty but simple pattern for a moulded table-bracket, which may be suggestive and attractive to many. It is a combination of a rectangular oblong and an oval.

Brackets on staircases.

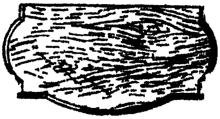
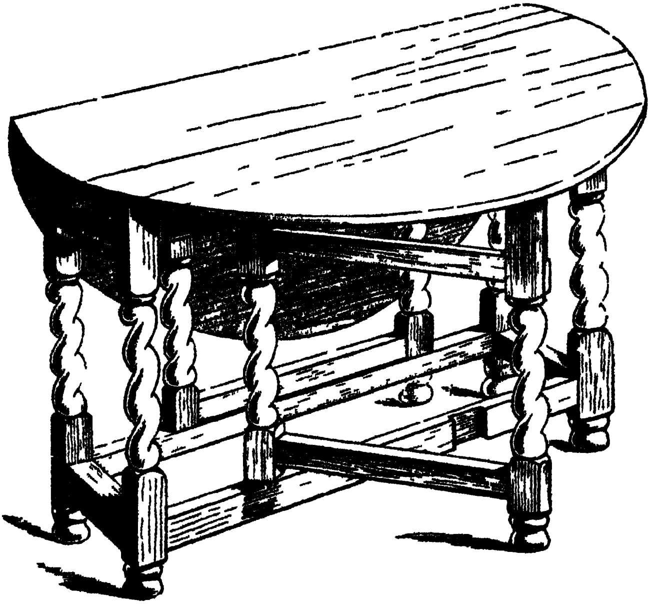


Fig. 104. Pattern for table bracket.

169. The staircase and everything that can be connected with it has now, I think, been exhaustively handled. It is a part of the house on which decoration may be well lavished, as it is the part of the house which first meets the eye of a visitor; and we all know the value of first impressions. To those home carpenters who are inclined to go in wholesale for decoration, I would suggest the job of panelling the bottom part of a staircase—I mean the bottom part of the wall from hall to topmost story,—lining or coating the wall with various woods used in fret-cutting—using a dark and light wood in alternation, and then hiding the joint with mocking about ⅜ inch thick. Suppose, for example, that the ground work of the panels was formed of sequvia and birds'-eye maple in alternation, and that the mocking was in walnut. The woods would have to be put on in equal pieces, and then a band of walnut run over the bottom of the pieces just over the skirting, and an arcaded piece just under the chair rail, which might consist of a flat member below, grooved along the upper edge in front

Suggestions for decorative work on staircases.

at the top, and having a shallow moulding, consisting of a shallow arc of a circle in the centre of the flat Such a dado with a wall above it, worked in alabastine and of a delicate primrose or very pale rose or lavender in tint, would look very well, but the cost of the dado would be considerable, and the labour very great—too great, perhaps, for any home carpenter to attempt. Still, here is the suggestion, and without doubt one or other of my readers will turn it to good account



Eight-legged Table

CHAPTER VI.

CELLARS AND BASEMENTS: WHAT MAY BE DONE IN THEM.

Difference between Basement and Cellars—Course of Procedure—Lack of Cellar Room in Houses—An Awkward Staircase—Another Space between Doors—How it was utilised—Jointing up for Sides of Cupboard—Dowels and Dowelling—Top of Cupboard—Panelled Doors—Provision for holding Bottles—How the Cupboard was fixed—Hanging Doors—Lock and Bolts—Putting on Top—Arrangements for Filter—Cellar under Stairs—Construction of Staircase—Dimensions of Parts—Winders in Staircases—Framing for Front, etc.—Compartments in Cellar—Dimensions of Compartments—Formation of Doors—Compartment for Ale Cask—Arrangement of Wine Bin—Space for Liqueurs, etc.—Apology for Subject—The Cask-Stand—Parts of Cask-Stand and their Dimensions—Preparation of Parts—Sawing up Timber—Preparation for Jointing—Necessity for Minuteness of Detail—Cutting Dovetails for Cross Pieces of Frame—Forming Pin of Dovetail—Fitting Parts of Frame together—Mortises for Tenons—Fastening up Frame—Wooden Pins in Carpentry—Stands for Casks placed on Side—Appliance to Steady Cask—Dimensions of Nine-Gallon Cask—Advantages of Position of Cask on Stand—Construction of Front of Cask-Rest—Striking Arcs on Front Board of Cask-Rest—Striking Arcs on Back Board of Cask-Rest—Modification of Construction of Fittings according to Position—Position and Temperature of Cellars—Strictures on Basements and Half-Basements—The Cellar proper, its Position and Size—Compartments—Provision for Stowage of Bottles—Farrow & Jackson's Iron Wine Bins—Division of Cellar by Wooden Slabs—Position and Dimensions of Horizontal Slabs—Construction of Supports of Lower Shelf—Diagonal Braces—Partitions supporting upper Slab—Grooving for Partitions in lower Slab—Grooving in upper Slab and fixing Partitions—Tramways in Floor for Cask Stands—Adaptation of Casing as Tenants' Fixture for Removal—Form and Dimensions of Wine Bottle—Old Mode of Stowing away Bottles—Forms of Wooden Wine Bins—Diamond-Shaped Framing for Bin—Construction of Framing—Rectangular Framing for Bins—Cradle Bin—Improvement of Cellarage—Framing to Cellar Doors—Excavating Soil under Entrance Hall—Underpinning Walls—Members or Parts of Door Frame—Architrave, Jambs and Sill—Construction of Door Frame—Dimensions of Parts—Connection of Parts by Mortise and Tenon—Mortises in Architrave—Tenons in Jambs—Fitting together—Putting Frames in Place and Fixing them—Wedges between Frame and Wall—Plumb Level and Plumb Bob—Application of Plumb Level—Match-Boarding in Ceiling—Partition between Pantry and Vestibule—Filling Side Panels—Springing in—Pantry Door—Shelves in Pantry—Cement Floor.

170. Having finished with the staircase, let us go down into the basement or cellars of the house, and see what may be done therein. That which I have said about the staircase will apply in some particulars to these parts of the house. I do not include the stairs that lead to basement or cellars in the staircase of the house, although in some cases it may be regarded as the initial flight, especially when morning-room and kitchen find their where-

abouts in the former. In London basements are the rule; for the area devoted to the house itself is but small and restricted; building space, and a natural thirst on the part of the owner of the ground—a natural greed, I had better say—for ground rents, has led to the piling up of houses, story upon story, and flat upon flat, until some of them inevitably suggest comparison with Pelion on Ossa, and the lightning-riven Birs Nemroud, the type or actuality of the wondrous Tower of Babel. I will take it that there is just this difference between basement and cellarage—that the basement is that part of a house which lies partly or entirely below the level of the ground without, and is devoted in part to kitchen, morning, or ordinary living room and offices, and that the cellarage, properly so-called, is the space under a building, and as a rule below the surface of the ground, where provisions and stores of all kinds, whether of fluids or solids, and all sorts of fuel are commonly kept. When a basement is only partly below the ground level it is called a half-basement.

Difference between basement and cellars.

171. I always like to try when writing to mark out some definite course of description, some shape of action clearly marked out, and to pursue it as closely as possible, making little digressions here and there when necessary; and so, acting on the definition of basement and cellarage given above, collectively as to position and individually as to purpose, I shall endeavour first of all to deal with basements; then with fittings, and a certain class of furniture, if I may so speak of them, that are appropriate alike to basement and cellar; and, thirdly, with improvements that may be frequently effected in cellarage at large. There is and there must be of necessity an overlapping of these things in some particulars; but I will try to keep the skein of description as free from tangles as I can, and to go from beginning to end of the chapter without making more breaks in the thread of my discourse than I can possibly help.

Course of procedure

172. And first with regard to basements and places which are entirely destitute of provision for the storage of ale, wines, spirits, etc. I am perfectly aware that there is a large section of society—I mean society in the most general and extended sense of the word, and not in its restricted application to the top crust or stratum known as the "upper ten"—who are so intently bent on forcing the adoption of their own views on all alike, that they entirely forget that there is such a thing as personal freedom of opinion and freedom of action, especially in matters of eating and drinking, in which Holy Scripture itself permits every one to please himself or herself, as the case may be, as long as God's good gifts are fairly used and not abused. These, without

doubt, would like to have all houses built on the principle mentioned above; and would take care that there shall be, at all events, no more ale, though they may wink at the continuance of cakes. But I am writing for people in general, and not for any set of faddists in particular; so I shall not refrain from describing here, and describing at length, all means that come within my knowledge of making up for the deficiencies in houses to which I have alluded above. But although a house may be entirely devoid of anything in the form of a cellar, it is certainly not very often that one meets with a house in which there is not a single available nook or corner in which a substitute for a cellar can be made. It is only once in my lifetime that I myself have come across such a house; and as it was one in which I lived for three years, I will describe presently how I managed to remedy its deficiency in cellarage. It was unusually prolific in what I may call small rooms in the basement; but the position of these rooms was such that it was impossible to utilise any of them as a wine cellar, or rather, if any of them had been so utilised, they would have proved far too large for the purpose in view.

Lack of cellar room in houses.

173. The basement was reached by a staircase, so peculiar in its construction that the recess below it was the least possible—so small, in fact, that when it was necessary, as it happened, to repair the stairs immediately leading to the basement floor, it was with great difficulty that the carpenter employed could get at them so as to introduce and fix the supports that were required. The staircase was made in this way. From the entrance hall, if I may use so dignified an epithet for it, a short flight of stairs led on to a landing from which access was obtained to the garden. The innermost part of this landing was supported on a brick wall, so that there was no space under it, and from it another short flight led to the basement floor. Here was a small lobby with four doors opening on it—one to the right as you came down the stairs, giving entrance to the kitchen, another in front, belonging to the coal cellar, and two to the left, giving entrance, the nearer one to the back kitchen or wash-house, and the further one to a pantry. From the back kitchen itself access was gained to another small room by the side of the pantry, and similar to it in size and shape which was used by us as a lumber and box room.

An awkward staircase.

174. Now it was easy enough to put a cask of ale in the pantry, and this was done; but it was not so easy to contrive a receptacle for wine bottles in the same place, having regard to the nature of the shelves, etc., which formed its internal] fittings, so I was obliged to look elsewhere for

Another space between doors.

a convenient place, and this I found between the two doors that led, the one into the back kitchen and the other into the pantry. The space between the doors was, as far as I remember, about 3 feet 6 inches, and the width of the basement lobby about 6 feet; and as they bear but little on the construction of the contrivance to be described, I will assume that these were the actual measurements of the place and parts to which I am alluding.

How it was utilised.

Jointing up for sides of cupboard.

175. I will not inflict a plan of the basement that I have been attempting to describe on my readers, for I trust my description has been sufficiently clear to enable them to understand the arrangement without the assistance of a diagram; but I will at once proceed to explain how I availed myself of the space between the doors of the back kitchen and the pantry, and as a diagram is now necessary I give it in Fig. 105, showing the front elevation of the structure that I made. To this I add the side elevation of the wine cupboard in Fig. 106, as it may be useful to beginners in carpentry to see how the affair was managed from the beginning to the completion. For convenience sake I will first say that the various parts of the wine cupboard are similarly lettered in Figs. 105, 106 and 107. All my readers well know, or ought to know, as I have already drawn attention to it, that to the outermost edge of the jambs and architrave of a door frame is affixed a moulding which surrounds it after the manner of three sides of a picture frame. On the outside edge this moulding is about 1 inch in thickness. The first step that I took was to prepare two sides for the cupboard, 13 inches in width and 3 feet in length, lettered A in the diagrams. Any one who sets about making a similar cupboard will find that whether he uses 9-inch board or 11-inch

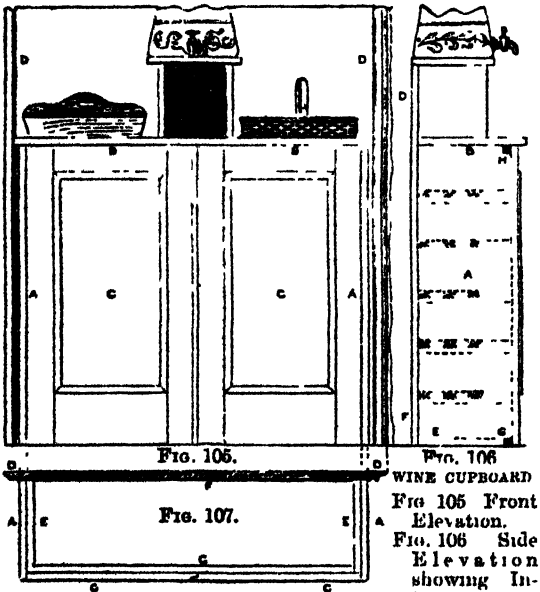


FIG. 105.

FIG. 106 WINE CUPBOARD

FIG. 107.

FIG 105 Front Elevation.
FIG. 106 Side Elevation showing Interior.
FIG. 107. Plan.

Scale ⅜-inch to 1 foot.

board he will have to add a piece in order to get the requisite width, and this may be done either by means of a groove and tongue-joint, or by nailing on a piece of the requisite width, namely, 2 inches, if 11-inch board be used, or by dowelling. Whenever it is merely a narrow piece of wood that need be added to the wider piece, it may be done by nailing or by screwing with long thin screws. Thus in adding a piece 2 inches in width to an 11-inch board, best done, as I have already explained, by nailing or screwing on at the *back* of the piece, instead of the front, wire nails from 2½ inches to 3 inches in length should be used, and the holes into which they enter should be deeply countersunk with a centre bit or other suitable bit, a trifle wider than the head of the nail, so that the head may be well knocked in with punch and hammer, and not only hidden from view, but prevented from doing any injury to the plane iron when the new edge of the board is planed up. The holes, if very deep, may be plugged with wood, or if shallow stopped with putty. In adding a piece of 4 inches in width to a 9-inch board, do so by means of a groove and tongue-joint, if you can make it; but, if not, try dowelling, which is a very durable and effective way. This process, however, merits description; and in order to do so, I will make a slight digression.

Dowels and dowelling.

176. A dowel has been well defined as "a pin or block of wood or metal, fitting into holes in the abutting portions of two pieces, and being partly in one piece and partly in the other to keep them in their proper relative position". Therefore a dowel joint is a joint secured by a dowel or dowels, and it is the method employed in making such a joint that I am about to describe. Dowels, as said above, may be pins or pegs of wood, or pins of metal; and for metal pins I know of none better or more handy than wire nails with the heads filed off, and the blunt end thus produced sharpened to a point with a file. This may be most readily done by gripping the nail in a vice, and thus holding it firm while the sharpening process is being carried out. When the edges of the boards have been truly planed up and shot, bring them together in the manner shown in the upper part of Fig. 108, which shows the edges of the boards in plan. A line has been drawn along the centre of the edge of each board, as shown by the dotted lines, with the gauge, and then with pencil and square. Transverse markings have been

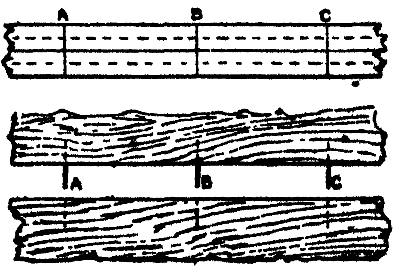


Fig. 108 Boards marked and prepared for Dowelling.

made at A, B, and C. It will greatly facilitate matters and ensure correctness if the boards are held firmly together by clamps before the transverse marks are made. The points in which the gauge line and pencil lines cross indicate the places in which the dowels should enter each board. The lower part of Fig. 108 shows the surface of the boards in position for being brought together. Bore holes in each with a bradawl at the points indicated in the upper part of the diagram, and insert the wire nails in one of the pieces in the direction of the dotted lines, which show the course and extent of the holes bored with the bradawl. Then bring the points of the nails to the orifices of the holes bored in the other board, and bring the edges close together with blows from a mallet. If the edges be glued with waterproof glue, and the boards wedged up in a clamp or clamps, as already shown, a joint of great strength and capability of resisting both tension and fracture will be formed. Indeed, I have always found the greatest difficulty in disconnecting two boards joined together simply by wire nails, and without any glue whatever. This mode of dowel-jointing will be found most useful in many operations of this kind necessary in home and household carpentry.

Top of cupboard.

Panelled doors

177. To proceed, however, with the construction of our substitute for a wine-cellar, let me go on to say that for the top I prepared another board, B, 14 inches in width and 3 feet 8 inches long, to serve as the top of the cupboard. This and the sides were made out of inch stuff, so that their thickness when planed down may be put at ⅞ inch. If the maker prefer to do so, for strength's sake he may make his sides 1 inch longer and mortise them into the top; but I do not recommend this mode of procedure because it tends to disfigure the surface of the top of the cupboard when completed. Lastly, I made two panelled doors, C, C, the frames being of ⅞-inch stuff, and the panels of ⅝-inch stuff, or rather of these thicknesses when planed up I cut a ½-inch rabbet in the frames for the reception of the panels, and glued and bradded them in, adding a thin moulding all round each panel on the exterior. The moulding was something like a quarter of a long ellipse in shape, and stood a little above the frame, where it abutted against it, the sharp edge rising above the frame being slightly rounded off. The sides, top, and doors of the cupboard being made, all was so far ready for fixing.

178. Before proceeding to take this step, however, it was necessary to consider what provision I should make for the reception of the bottles, and this led me to get out some slips of wood, 12 inches long, 1½ inches wide and ¾ inch thick, and some laths of the same thickness and 1 inch in width. At

this time I had not then thought of the trellis work and cradles for bottles that will be described further on. Had I done so, I should have used them in preference to the laths. On the inside of each side of the cupboard I screwed five slips of the width and thickness mentioned, cutting them of the shape shown in Fig. 106. By this means the interior of the cupboard was fitted with five shelves, when the laths were dropped into the notches shown in Fig. 106, the floor of the basement forming a sixth. The slips being screwed on, and the laths in readiness to be cut to the necessary length, when the cupboard was placed *in situ*, I proceeded to fix it.

Provision for holding bottles.

179. My first care was to screw down two slips, 1 inch square and 10½ inches long, to the floor in the position shown by E, E, in Fig. 107, as stops to which to screw the lower ends of the sides of the cupboard. I then had to cut away a piece of the inner edge of each side to fit them over the skirting F, and to bring the rest of the inner edge against the wall at the back, and the moulding surrounding the door frame at the side. When the sides were nicely and squarely adjusted, I screwed them to the mouldings from the inside of the sides, and to the stops already fixed to the floor from the outside. I then screwed to the floor another slip G, also 1 inch square, butting against the outer ends of the slips E, E. This served as a stop to prevent the doors of the cupboard from being pushed further in than they ought to be when attached to the sides by hinges, and I cut two notches in the upper ends of the sides, ⅞ inch from the outside edge, into which I dropped a rail H, in Fig. 106, which was directly over the stop G in Fig. 107. This served as a stop to the cupboard doors at the top in precisely the same way as G at the bottom. When this rail was fixed, I cut the laths that were to form the skeleton shelves of the interior to the proper length, and dropped them into their places. I had fixed one flap of each hinge to the edges of the doors, and made recesses for the corresponding flaps in the inner surface of the sides at the outer edge, so that when the sides were fixed and the laths in the interior in position, I could immediately proceed to hang the doors. The edges of the doors were rabbeted so that the rabbet of the door on the right-hand side overlapped the rabbet of the door on the left-hand side. I attached two small bolts to slip into sockets, cut in the rail at the top, and stop G at the bottom to the inner surface of the right-hand style of the door on the left-hand side, and a good cupboard lock to the inner surface of the left-hand style of the door on the right-hand side, which rendered it secure against all comers who could have no business there.

How the cupboard was fixed.

Hanging doors.

Lock and bolts.

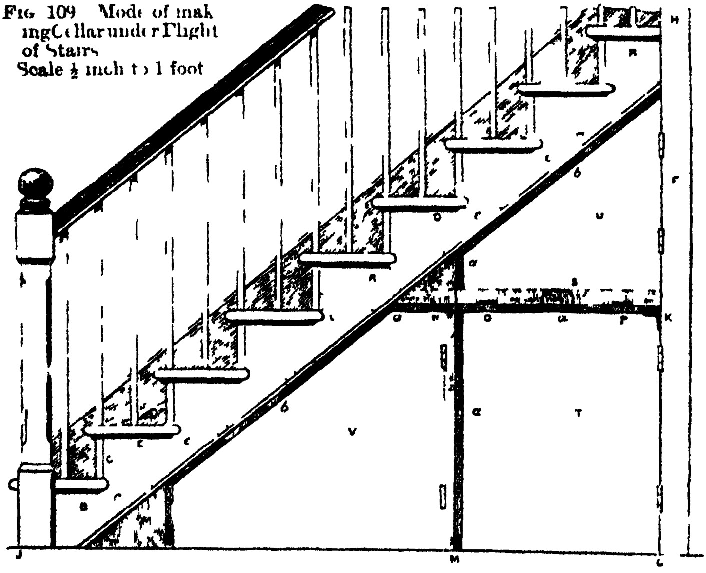
180. The last thing to be done was to put on the top, and to do this as strongly and securely as possible I screwed a slip to the inner surface of each side flush with the top of the side. Then after notching the inner corners of the top sufficiently to allow the top to fit closely against the surface of the wall and tightly between the mouldings, I screwed it down to the rail running across from side to side in front and to the slips that I had just fixed to the interior of the sides. Thus far all was finished but it struck me, as an after thought that the top of the cupboard would form a convenient place whereon to stand the filter, so I placed a little box on the top, open in front which was 9 inches square and was surmounted by a slab 10 inches by 11 inches thus elevating the filter so that a jug could be placed under the tap and the water drawn without difficulty. In summer time the water in this filter was kept deliciously cool by covering it with a cap or cover of coarse woollen stuff which was wetted and wrung out two or three times a day. And I trust that the fact that I took care to look after the water as well as the ale and the wine, will partly tend to make my peace with those followers of Father Mathew and Sir Wilfrid Lawson who may happen to read this chapter on cellars.

Putting on top

Arrangements for filter

181. Let us now take the case of a space immediately under the flight of stairs leading to the basement of a house that has not been utilised as a cupboard, and which may therefore be converted by the occupier of the house into a small cellar if he feels inclined to do so. In the generality of houses the flights of stairs

FIG. 109. Mode of making Cellar under Flight of Stairs. Scale ½ inch to 1 foot.



rise one immediately above the other, and are ceiled in below, so that it is only the ground floor flight if there be neither basement nor cellarage, or the base flight, or rather the space under it, that can be made available for the purpose under consideration; and in houses with a basement story or cellars, in which the space below the stairs on the ground floor has been converted into a cupboard, the stairs leading to the basement are placed far to the rear of these, or in such a position as to render it wholly unnecessary to devote the space under the ground-floor stairs as headway for the descent of the cellar stairs. Therefore, the instructions that I am about to give are applicable to the utilisation of unoccupied space below the lowest flight of stairs, whether the stairs be in the basement or on the ground floor.

Cellar under stairs.

182 Although I am not going to describe the construction of a flight of stairs, it is necessary to say just enough about it to enable the reader to understand my directions for converting any space below a flight of stairs into a cellar. To this end let me remind him that there are in every flight two string boards to receive the end of the stairs, one of which abuts against the wall to receive the inner ends, and the other on the outside to receive the outer ends The inner string board against the wall is *always* made as shown by the shaded board, A A, in the elevation of the lower portion of a flight of stairs, exhibited in Fig. 109 which is of a plain and simple description, terminating in a newel at the bottom, and not in the volute ordinarily used, which, to my mind, as I have already said in a previous chapter, is excessively ugly and unmeaning in appearance. The outer string-board is sometimes in the same form as the inner one, but it is more frequently cut in the form B B, shown in the illustration, so that the ends of the risers and the treads may be nailed to it. The risers are the upright or vertical pieces which form the fronts of the stairs, and the treads the horizontal pieces on which the feet are placed in ascending and descending The end of the risers are indicated by dotted lines, as shown at C. The rounded edge of the head in front is technically termed the nosing. This nosing is generally continued on the exterior by a piece nailed on to the edge of the head, as at D, and a piece of simple moulding, as at E, is attached under the nosing in front and at the side.

Construction of staircase.

183. We will suppose that we are dealing with a strong and well-made flight of nine steps or stairs supported at the upper end, by the post F, and having a stout post at the lower end. As the illustration is drawn on a scale of ½ inch to the foot, these posts are 3 inches square.

Dimensions of parts.

Now the ordinary height of the risers of a flight of stairs is 7 inches, and the width of the treads from the front of one riser to the front of another, exclusive of the nosing, is 9 inches: and therefore supposing the stairs to be made of 1-inch stuff, the height from G to H to the top of the highest stair is (7 inches × 9 inches) + 1 inch = 64 inches, and the length from G to J is (9 inches × 9 inches) − 1½ inches = 79½ inches, the deduction made being half the thickness of the post G H. I have said nothing about the ends of the winders above the highest stairs shown, by which a change in direction is usually made, and which may extend to a quarter circle or a half circle as necessary, because these have nothing to do with the subject now under consideration; and I have not taken into account the space to be found under these winders, because this is often utilised for other purposes, such as a small pantry, etc.; and if any amateur finds this space unoccupied, he will easily understand from what has been said how to turn it to account.

Winders in staircases.

Framing for front, etc.

Compartments in cellar.

184. In fitting up the triangular space G H J, as a cellar, the first thing to be done is to cut a piece of quartering, 2 inches square, shown in the drawing by K L, and another, M N, the length of K L being a trifle over 3 feet, and the height of M N 2 feet 7½ inches, allowing for the tenon at the end N, which is to be mortised into K L at N. If preferred, the piece M N may be made long enough to reach to the under surface of the head of the stair immediately above it and halved into K L, similar pieces must be cut to go against the wall at the back, and two cross pieces, whose outer tenons are shown at O and P, mortised into K L, and its corresponding piece at the back of the space. If the house belongs to the occupier he can mortise the end K, of the piece K L, into the post G H, but if not he must content himself by supporting it on a small angle iron as shown at K. The end M of the upright M N may be mortised into the floor or screwed in position by angle irons as at K. We have now all the framework that is necessary, and to finish its attachment to the flight of stairs the end L of K L must be screwed to the inside of the string-board B B, and the upper part of M N must be screwed to the same string board if the upright in question be carried high, as shown by dotted lines between N and Q. Put in an upright cross piece, extending from string-board to string-board at B, because the space behind it to the left hand is not large enough to be of use. Lay a flooring of ⅝ or ¾ board on the cross pieces, O P, extending from B to the post F, and inside it, and having screwed or nailed slips to the inner surface of M N, and the opposite surface of the upright at the back that corresponds to it,

attach boards to them—½ inch match-boarding is stout enough—so as to form a partition right across the lower space from the floor G M J to the floor S above it.

185. We have now three compartments—one at T a rectangular one, 2 feet 5½ inches in height in the clear and 2 feet 1 inch wide; a triangular one, or nearly so at U, 1 foot 1 inch high by 2 feet 1 inch wide; and another triangular one at V, 2 feet 10 inches long by 2 feet 5½ inches high. It must be understood that I have only given the height and width of the openings that afford means of access to the three compartments, T U V, as they appear in the diagram. I am not yet dealing with the *whole* of the interior space, or rather that portion of it immediately under the stairs and within the string boards. The compartments are to be closed by doors—ledge doors made of match boarding will do, unless the amateur is inclined to make panelled doors, which look much better; and as there is no necessity to waste more of the interior space than can be helped, the framework itself can be made to serve as stops at the parts lettered *a* by nailing slips to the exterior as at Y and Z, and the triangular piece X. A similar piece W, must be put in under the string-board to the left, and to this and to the string board other slips marked *b* must be nailed. The doors must be hung by hinges, as shown. With regard to the respective uses of the compartments, T will afford accommodation for a 9-gallon cask of ale, the stalder being fitted with wheels so that it may be easily run in and out as described in a previous paper, and U and V will serve for the stowage of wine. Each door should be fitted with a good lock, the bolts of the locks of the door of the compartments U and V being shot into sockets cut in the edge of the string board B B.

Dimensions of compartments.

Formation of doors.

Compartment for ale cask.

186. For the stowage of wine the amateur will have to construct two frames for each of the compartments U and V, either of square trellis, or in the form of cradles, as will be shown presently. As the dimensions of each form will be duly given I must leave every one who sets about making a cellar of this kind to work out the frame for himself, according to the space at his command. I say *two* frames, because as the width of an ordinary staircase ranges from 2 feet 6 inches to 2 feet 9 inches, there is depth enough for one frame to stand in front of the other when it is pushed back as far as it will go. Of course, the bottles in the frame behind cannot be got at without removing the frame in front, so the wine in the front frame must be used first. The frames must be made of such a size that they may be easily put in and taken out through the openings that afford access to the compartments.

Arrangement of wine bin.

Space for liqueurs, etc.

187. But I have not yet filled all the available space under the stairs, and I may point out that two rows of eight or nine bottles may be laid on the floor in the space B W, under the lowest stair and the lowest but one, by putting one row on top of the other; and, further, by nailing slips to the string-boards, as shown at *c*, *c*, *c*, to support the ends of boards laid on them; with a narrow ledge nailed to the edge of each board in front, accommodation may be made for ten bottles more, and in the space Q X, which is 10½ inches high, standing room may be found for a few of those nice little bulb-shaped bottles in which a temporary abiding-place is found for ginger brandy and other liqueurs of a similar class and character.

Apology for subject.

187. I do not remember having seen in any book of this kind instructions in detail on methods of fitting up the cellar for its especial duties of storing ale, beer, cider, wine, spirits, etc.; and as I am inclined to think that a few words on the subject may be found useful by many who are content to partake of these things occasionally and in moderation *using* them in the true sense of the word, and not *abusing* them —I will endeavour to fill up the gap here to the best of my power and ability. I have not the slightest wish or intention to give offence to any persons who may be pleased to think differently to myself on the subject of abstinence from alcoholic drinks; and all who are inclined to find fault with me for dealing, and dealing at length, with a subject that is in no way in accordance with their own opinions, views, and wishes, must kindly bear in mind that I am writing, not for any particular section of amateur wood workers, but for one and all alike; and that my instructions must therefore be drawn up in such a manner as to meet the requirements of all parties, catering for all alike. Moreover, the filling up of a space under a flight of stairs may be put to many other purposes besides that which I have had chiefly in my mind here. A cupboard, after all, is a cupboard pure and simple, and as such, my cellar, or substitute for a cellar, must be regarded by all who do not care to use it as a cellar. Here, however, steadily keeping in view the object with which I started, I must endeavour to shape my remarks in such a way that they may be useful both to those who have cellars and to those who have not, or may be making substitutes for them, so as to enable the former to fit up the interior in a suitable manner, and the latter not only to do this, but to provide a decent substitute for the missing receptacle for bottles.

189. Let us begin with the cask-stand, which is called a "mare" in some parts of England, and in others a "stalder". This is in itself a stout frame of wood raised from 9 inches to 12 inches above the ground on short

massive legs: and as supports and stands of this kind are useful in more places than the cellar, and as there will be many readers of this volume that are only beginners in carpentry, I will make no apology for describing a good method of making it. For a light cask, stuff 2 inches by 2 inches may be used; but for heavy casks it is desirable that the material should be 3 inches by 2 inches, or even 3 inches by 3 inches. Stuff of the same dimensions should be used for all the parts of the stand—side-pieces, cross pieces, and legs. The size and height of the stand must be regulated partly by the capacity of the cask which is to be supported by it, and partly by the situation in which it is placed, and, as a matter of course, these can only be appropriately determined by the maker.

The cask-stand.

190. To make a simple stand, which in point of fact will serve as the foundation for the attachment of other parts, which may render it more convenient and suitable for the purpose for which it is destined, eight pieces are required - namely, two side pieces and two cross-pieces for the frame, and four legs to support it. For a nine-gallon cask the stand may be 22 inches long, 15 inches wide, and 9 inches high, and may be made of stuff 2½ inches square. These dimensions are preserved in the plan and side and end elevations of the stand, which are shown in Figs. 110, 111, and 112 respectively, and which are drawn on a scale of 1 inch to 1 foot.

Parts of cask-stand and their dimensions.

191. In the plan given in Fig. 110, the appearance of the frame is shown when viewed from above. To make the stand, material to the length of 9 feet 2 inches will be required; or say 9 feet 6 inches, to allow for waste in sawing up the timber to the sizes required for the parts of the stand. Plane off the stuff on all sides first of all; the planing need not be very finely done, but only sufficiently to produce a tolerably smooth face all round. Mark off a piece 1 foot 10 inches long for the side A, and cut it off, taking care to cut outside the pencil line, but close up to it, so that when the piece is cut off the pencil mark may still be distinguishable, and carry the pencil marking all round the wood as a help and guide in cutting off the piece truly and in square. If you are a "green hand" at carpentry, be content to mark off one piece at a time, as if you mark off all the pieces at once to the bare length of each, you will find that you have allowed nothing for waste in sawing, and every piece will be slightly short. Having cut off the side A, proceed to mark and cut off the side B in the same manner, and then the cross-pieces C, D, which are each 15 inches in length, and lastly the four legs, E, F, G, H, the ends of which, when mortised

Preparation of parts: Sawing up timber.

into the frame, are shown at the parts indicated by these letters in Fig. 110, and the sides of three of them at E and F in Fig. 111, and F and G in Fig. 112. The same parts are distinguished in each figure by the same letter, and the dimensions of the pieces of the stand, and the mortises and dovetail joints by which they are fitted together, are indicated by figures.

Preparation for jointing

192. Having cut all the pieces to the required length, mark out on A from each end three points the first 1½ inches from the end, the second 4 inches, and the third 6½ inches. Then put A and B together side by side, so that the top of each piece is flush with that of the other, and with the square and pencil draw straight lines through the points already obtained by measurement The first square of 2½ inches from each end is intended for the reception of the leg, and the second for the end of the cross-pieces that are to be fitted into the side of that part, one by mortise and tenon, and the other by a dovetail. Carry the pencil marks round the timbers on all sides; a great deal of trouble is saved in doing this first of all, and it ensures perfect accuracy of fit and jointing in every part. Next measure off 2½ inches from each end of the cross pieces C and D, and from the end of each leg, and with the pencil and square, mark lines at this distance from the ends of the pieces on all sides

Necessity for minuteness of detail

193. Many will say, without doubt, "We know all about this, and it would have been sufficient to give us the working drawings, and leave the dimensions and the mode of doing the work to us, as the operations you are describing are simple in the extreme, and you are going into minor details which are not required". This is all very true; but I trust I shall be forgiven for being somewhat prolix and tedious, by explaining that in writing as I have on this subject, I am doing my best to perform the feat that is commonly known as "killing two birds with one stone". I am often asked by correspondents to give instructions after my manner in simple and elementary carpentry, and this I am

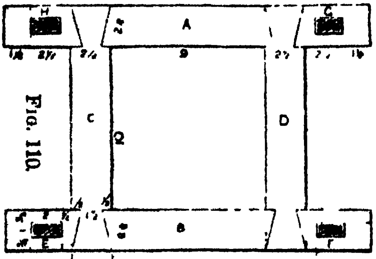


Fig. 110.

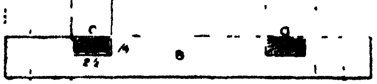


Fig. 111.

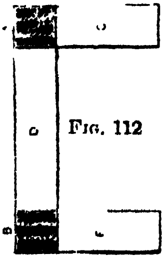


Fig. 112

Fig. 110 Plan showing Construction of Frame of Cask Stand
Fig. 111. Side Elevation of Cask Stand
Fig. 112 End Elevation of Cask Stand.

endeavouring to do in the present volume to the best of my ability, for the benefit of those who require such instructions; so whenever I am describing the construction of any particular article that is made of wood I will put my description in such a form as will assimilate it to a lesson in simple carpentry, on the plea that this mode of procedure, while it will greatly benefit and assist beginners, will in no way hurt those who are more advanced, except in trespassing a little on their time and patience.

Cutting dovetails for cross-pieces of frame.

194. Having marked all the pieces, measure ½ inch on the inner edge of the top of each of the sides from the corners of the square intended for the reception of the ends of the cross pieces, and from the marks thus made draw straight lines to the opposite corners of the square, on the outer edge of each side, as shown in Fig. 110. Then set the gauge to 1¼ inch, and make marks along the outer and inner surface, forming the sides of each side piece to show the depth of the dovetail, and with the square carry down marks from the points taken at ½ inch from the corners of the square to show the width of the narrow part of the dovetail. Having done this at each end of the side pieces, cut through the slanting lines forming the sides of the dovetail with a tenon saw, carrying the cuts down to the lines marked by the gauge, and then clear away the wood between the slanting cuts thus made with a mallet and chisel, carrying the edge of the chisel along the marks made by the gauge, and smoothing the bottom of the opening with the chisel, so as to render it as even as possible.

Forming pin of dovetail

195. The next step is to mark the ends of the cross-pieces so as to define the pin to fit into each dovetail in the side pieces. Each end, it will have been already seen, is to be halved into the side piece, so the depth must be marked by the gauge, which remains set at 1¼ inch, and by the two cuts with the tenon saw, one vertical and one horizontal, the lower half of each end is cut away, leaving the upper half to be formed into the pin of the dovetail joint. All that is to be done is to measure half inch from the inner corner of the square marked at the end of the top of each cross-piece, and then draw slanting lines to each corner, as shown in the plan in Fig 110. The great thing to be borne in mind in order to ensure a close and perfect fit is to cut *inside* the pencil marks on each side in sawing the dovetail in the side pieces, and *outside* the pencil marks in sawing the pins, keeping the saw close to the pencil marks, but taking care, as already enjoined, not to obliterate them.

196. This done, the side and cross-pieces of the frame may be fitted together, and if there is anything which prevents the entrance of the pins

Fitting parts of frame together.

into the dovetail, the surface of any part where it joins too tightly must be eased with the chisel, but the parts should fit tightly together, so that it is necessary to use the mallet to knock them apart again. The top and bottom of all the four pieces should be flush one with another.

Mortises for tenons.

197. Having knocked the pieces apart, the next step will be to cut a tenon at the end of each leg, and to prepare mortises in the side-pieces for the reception of the tenons. First of all, cut away ½ inch on the inside of each leg; or, to make my meaning perfectly clear, on the side which is opposite the front of each leg. The side view of each leg will then be as shown at E and F, in Fig. 111. The object of doing this is to create a shoulder on three sides of each leg, instead of on two only, to afford a little additional bearing for the frame and anything that is placed on it, and to leave as much wood as possible in the side-pieces, between the mortises and the notches cut to receive the pin of the dovetail. The top of each leg thus reduced will be 2½ inches by 2 inches, and ¾ inch must be taken off on each side of the length of the top, reducing it still further to 2 inches by 1 inch, the measurement of the top of each tenon, which is 2½ inches long. The mortises, measuring 2 inches by 1 inch, must be accurately marked by aid of the gauge—which, by the way, should have been used in marking the tenons—both on the top and the bottom of each end of the side pieces, and cut out with the mallet and chisel. In cutting a mortise, it is better to work from both sides when it is to be carried right through the timber, as the chance of coming out wrong on the other side is thus completely obviated, and any slight inaccuracy in the middle will not be apparent when the work is done

Fastening up frame.

Wooden pins in carpentry.

198. The parts of the frame may now be put together, and the ends of the cross-pieces may be screwed down to the side-pieces with 2-inch screws, or fastened by wooden pins, which are to be preferred to screws in a job of this kind, and should be used far more than they are by amateurs in carpentry or rough joinery such as this. The holes for the pins should be bored with a large gimlet or a small bit, and the pins themselves should be made of oak or red deal, of greater length than the hole they are intended to fill, so that the ends may be sawn off flush with the wood work when they are driven home. When the frame is completed, the legs can be fitted into their places in the same way as the pins of the dovetails were fitted into the notches, and secured by pins driven through the sides of the mortise and the tenon.

199. It is clear that such a stand as that which has been described

above is best suited for the reception of a cask placed upright on its end, and that it can be extended in length, so as to take two or more casks in this position as may be necessary. But when casks are placed in this position, they are large ones, and it is desirable that the stands should be made of stuff 3 inches square, or even larger, as 4 inches by 3 inches, and that additional legs and cross-pieces should be used to give stability to them. A nine-gallon cask, on the contrary, is laid on the stand on its side, and the tap is inserted in its head. But without pieces of wood jammed below it to act as stays to keep it steady and immovable, it would be apt to roll from side to side on a stand with a flat top. Let us see, then, what simple contrivance can be added to the stand to keep the cask steady in the first place: and, secondly, to prevent the operation known as "tipping," which becomes necessary when the contents of the cask are nearly exhausted, and which, if roughly performed, has the effect of rendering the last two or three quarts muddy and unpalatable, if not absolutely undrinkable.

Stands for casks placed on side.

Appliance to steady cask.

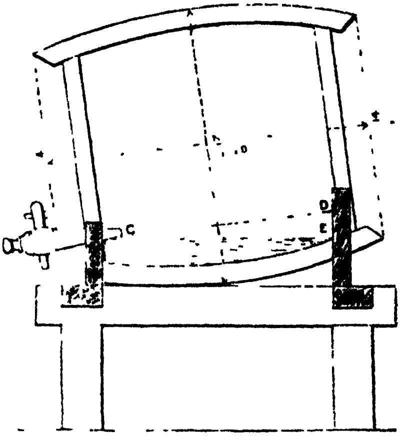


FIG. 113. Nine-gallon Cask on Cradle.

Dimensions of nine-gallon cask

200. Roughly speaking, the diameter of a nine-gallon cask at the ends, or top and bottom, is 14 inches, and in the centre 17 inches; and Fig. 113 represents the side view or side elevation of such a cask when placed on a stand of the construction and dimensions described above, or additions to the stand that form a cradle to keep it steady. The height of the cask from top to bottom, extreme measurement, it should be said, is 20 inches. Fig. 113, 114, 115, are drawn for clearness sake on a scale of $1\frac{1}{2}$ inches to 1 foot. The object is to regulate the cradle in such a manner as to obviate the necessity for tipping, and, therefore, such contrivances for

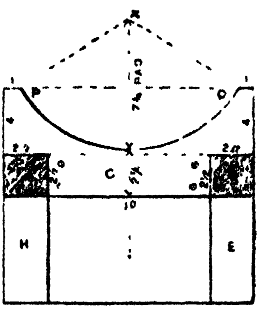


FIG. 114 Cradle in Front

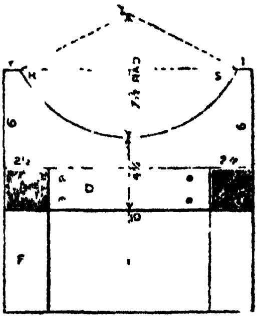


FIG. 115. Cradle at Back.

raising a cask at one end, as wheels and screws, which are found in Barlow's Cask Stand and stands similar to it in character. When a cask of liquor, be it what it may, is once put in position, it should remain so as long as there is anything in it, and that position should be such a one as will enable all the liquor to be drawn off that will come away fine and clear, and yet leave room for the settlement of all sediment. Of course, it must be understood and remembered that I am speaking of casks placed on their side, and not of those placed upright, which are often tapped at various places in the side.

Advantages of position of cask on stand.

201. In Fig. 113, as has been said, the nine-gallon cask is shown placed on the stand in the position in which it is to remain until the whole of the liquor within it, minus the dregs, is drawn off, and it is shown supported on a cradle at A and B, the construction of which will be explained presently. The tap is shown inserted in the cask. When placed on the stand without any cradle, it is clear that the liquor can only be drawn off to the level shown by the dotted line C D, and that what remains below this line must be wasted, or the cask must be tipped from behind in order to draw off a portion of it, and owing to the shaking given to the contents by tipping, the liquor is rendered turbid: but if the cask is placed on such a cradle as is shown here, the liquor can be drawn off to the level shown by the line C E, below which the dregs have settled. To effect this it is plain that the cradle must be lower in front than it is behind.

Construction of front of cask-rest.

202. To proceed with the construction of cask rest: for the piece in front, shown in elevation in Fig. 113, take a bit of inch board, 15 inches long and 7 inches wide, and plane it up, reducing the width of the board to 6¾ inches. At each of the lower corners mark off 2½ inches each way, measuring from the corner in each case, and mark lines at right angles to the sides of the board on the surface, with square and pencil. Cut out the squares thus marked with a tenon saw, and the board thus treated will fit down between the ends of the sides A B, projecting beyond the cross piece C, and against this cross piece, to which it can be secured by screws when finished and ready for fixing. But before this stage is arrived at, an arc must be cut for the reception of the cask. To determine this, bisect the top and bottom edge of the surface of the cradle that is to be turned to the front, and draw a straight line across the board from point to point, and continue this straight line along another piece of wood of the same thickness, placed tightly against the upper edge of the board to be cut. Then, along this line, represented in the figure by the dotted line between the number 10 and x, measure from the point 10 this number, by the way, represents the

measurement between the sides of the stand—a distance of 10½ inches, which will determine the point X. Then from the point X with a radius X P or X Q, equal to 7¾ inches, describe the arc P Q. Pass a very fine bradawl through X, turn the boards, and from the hole made by the bradawl, as a centre with a radius equal to 8 inches, describe another arc on the inner surface of the board which is to form the front part of the cradle. Now with a compass saw or keyhole saw, cut out the arc, directing the saw along the arc described on the outward surface of the wood. When this is done, the arc described on the inner surface will be apparent about ¼ inch from the edge of the saw cut. Take a spokeshave and pare away the inner edge, until a surface is obtained sloping inwards from the outer edge to the arc drawn on the inner edge. The object of this is to allow the cask to rest on a broad surface instead of a narrow edge, as it would have done had not the edge been pared away. The inclination from the outer edge to the inner edge is shown by the dotted line below A in Fig. 113. The back part of the cradle, shown in Fig. 115, is made in the same manner; but the wood when planed up must be 8½ inches wide, instead of 6¾ inches as for the front. The process of preparation is precisely the same as for the front, but the distance along the dotted line from the number 10 to X is 11¼ inches, and the radius with which the arc R S, on the outer surface of the board, is described is 7½ inches; that of the arc described on the inner surface being 7¾ inches. When the front and back of the cradle are ready, they may be screwed to the outer face of the cross-pieces, and this being done, the cask stand is complete.

Striking arcs on front board of cask-rest.

Striking arcs on back-board of cask-rest.

203. The mode of putting up a substitute for a cellar, and the best way of making the cask-stand and suitable apparatus for steadying a cask when placed on the stand has now been fully described, and we will now turn our attention to the method of making racks to hold bottles, and of constructing the rack in such a manner as to render them suitable for storage in cellars that are already made. In cellars, or substitutes for cellars that the amateur must make to himself, the construction of cellar and rack must be modified in accordance with space and position, so that each may be adapted to the other in the best manner possible for general convenience and for carrying out the purpose in view.

Modification of construction of fittings according to position.

204. Cellars for the storage of liquors should be below the surface of the ground, because in such a position an equable temperament is maintained all the year round. We are accustomed to say that underground cellars are warm in winter, and cool in summer; and this is due

Position and temperature of cellars.

to the fact, not that the change of temperature below the surface of the ground in cellars is inversely to the change of temperature in the room above, or in the air without the house; but that it is less variable, and attains a temperature but a little above its general average in the summer and but a little below it in the winter. There is, too, a certain degree of dampness to be found in cellars below ground, the result of their position, which is inseparable from them, though it may be greater in some and less in others. This it is which renders basement rooms in houses damp and cold in proportion to their depth, and the impossibility of getting within them much of the light and warmth that we derive from the sun, and it is the dampness and chilly aspect and temperature of basements that render them unhealthy. Half-basements are bad enough, but such basements as are seen in many towns and in all parts of London and its suburbs, having the top of the windows level with the roadway, are not fit for human beings to live and thrive in, and are therefore worthy of the most sweeping condemnation. But, again, cellarage under a house from one end to the other of it, and extending to every corner is useful, because it admits of free ventilation under the rooms on the ground floor, and is useful and appropriate for the stowage of coal, wood, provisions, liquors, and even lumber. My contention is, not that houses should be built without basements, but that the basement story should be devoted entirely to cellarage and stowage, and that no living rooms should find place therein.

Strictures on basements and half-basements.

205. The cellar proper is generally a small room, often little better than a recess, constructed in some part of the basement, or, when the kitchen or breakfast-room occupies the front part of the basement and opens into a narrow area, in an excavation extending under the sideway of a street, or made in the front garden, in which case it is generally covered in with flagstones. It is for the most part 6 feet to 7 feet in height, and when the door is unlocked and light enough has been admitted to render the interior visible, all you will see, in all probability, unless the cellar is stocked, will be some compartments at the back, generally nine in number, formed by two horizontal stone slabs or shelves, built into the wall, dividing the space into three parts, each of which, or at all events the upper and middle one, are again subdivided into smaller compartments by stone slabs placed vertically. And in these compartments the bottles must be piled, one upon another—a practice which is objectionable, because when the stock is large a great weight is super imposed upon the lower tiers of bottles, and there is greater danger of breakage in handling the

The cellar proper: its position and size.

Compartments.

stock. Moreover, the arrangement is a bar to keeping a variety of sorts and vintages in small quantities, for if a compartment is full there is no possible means of withdrawing a bottle from any of the lower tiers until the upper tiers have been consumed or removed to some other positions in order to get at the lower tiers.

Provision for stowage of bottles.

206. I will now proceed to describe and illustrate my own plan for providing for the stowage of bottles, merely premising that it was suggested to me by the iron wine bins constructed by Messrs. Farrow & Jackson and others. The principle involved is the same, but the method of carrying it out and the material used are widely different, for my racks are made of wood, which can be worked by amateurs far more easily than iron, which requires special manipulation and appliances. I may say for the benefit of iron workers, that the iron wine bin consists of a rectangular framing of iron, and that the compartments or cradles for the reception of individual bottles are formed by serpentine slips of iron lathing which must be bent into this form by aid of a mould to ensure regularity. These slips are then placed side by side, vertically, the position of each individual slip being the reverse of those which are immediately contiguous to it and on either side of it, and the slips or laths are riveted together at the points of contact. This description will be rendered more intelligible by Fig. 116, in which the principle of construction is exhibited. There is a double set of this iron trellis work, one in the front and the other at the back of the bin, each corresponding exactly to the other. The bottles are thrust into the cells, neck in front, and find support on the double trellis. The great advantage of the use of iron lathing in the manner shown is that less space is occupied by the trellis work, owing to the thinness of the material. I may say for the benefit of those who do not care to make appliances of this kind for themselves, that the iron bins constructed and supplied by Messrs. Farrow & Jackson, are most convenient as well as light and portable, and can be made to order to suit any particular space that is desired to occupy in this manner.

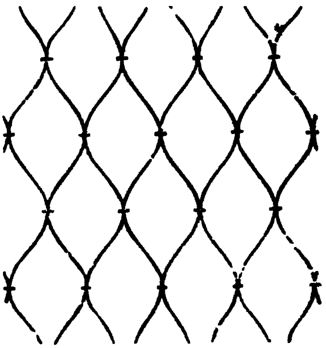


FIG. 116. Iron Lattice for Wine Bins.

Farrow & Jackson's iron wine bins.

207. We will suppose that our cellar is ready made to hand, and is divided into compartments by stone slabs and shelves arranged in the manner

Division of cellar by wooden slabs.

described above. If it be not thus divided, I should advise the amateur to do this for himself. Supposing, for example, that the cellar is 7 feet in height, I should put a slab of elm, 2 feet 3 inches wide, and of the requisite length to enable the ends to be let into the brickwork, across the back of the cellar at the clear height of 2 feet 6 inches from the ground, and another plank or slab of the same size midway between the first plank and the ceiling. The slabs should be 1½ inch in thickness. I show an example of this arrangement in Fig. 117, in which I have supposed the cellar to measure 8 feet from side to side, for the sake of drawing the figure to scale, though, as the space at the disposal of each amateur cellar-fitter will undoubtedly vary, its distribution can only be settled by the worker himself. It should be explained that Fig. 117 was drawn on a scale of ½ inch to 1 foot, but in the engraving itself it is very slightly in excess of this. I mention this because I find this to be the case when the engraving is tested both by the wood scale and ivory scale that I habitually use in the committal to paper of all plans, elevations, and sections, unless for special reasons I construct a scale from which to work, which, however, is always made on the proportional system used in geometry, and described in all elementary treatises on this subject. Allowance is usually made by the engraver for shrinkage when type and engraving are cast in plate, that is to say, when the pages of a work are stereotyped or electrotyped for reprinting. Paper, too, stretches when damped and contracts when it is once more dry. I call attention to these points lest any reader should detect the slight discrepancy, and wonder how it occurred.

Position and dimensions of horizontal slabs.

208. Working, however, according to the supposed dimensions, and taking P, Q, S, R to represent the end elevation of a cellar, 8 feet wide and 7 feet high, A B will represent the lower slab of elm, 2 feet 6 inches in the clear above the surface of the ground, and C D the upper slab. As the slabs are 1½ inches thick, the space between the lower and the upper slab, and between the upper slab and the ceiling, will be 2 feet 1½ inches. The lower shelf should be supported at F, K, and X, by three stout supports made of stuff 3 inches by 2 inches in section, braced and mortised and tenoned together as shown in Fig. 118. The side elevation of one of these supports is shown in the centre; the plan looking down upon it from above is shown above it, and on each side of it the appearance that each end elevation would present, that in the front being on the left hand, and that at the back to the right. The top rail A is 2 feet 3 inches long, the supports B and C, 2 feet 6 inches long. A tenon, 1½

Construction of supports of lower shelf.

inch by ¾ inch and 3 inches long, is cut at the top of each support, and mortises of the same size, 1½ inch distant from its ends, are cut in A, as shown in the plan at B and C.

Diagonal braces.

209. The parts D and E are braces applied diagonally to strengthen the support, and render it stiff and rigid. They may be cut out of inch stuff, and let into the uprights, as shown in the side elevation, and each end elevation. As the supports are 2 inches thick, and the braces 1 inch thick, the braces, when let into the supports flush with the surface of the sides of the supports, will cross each other, and touch at the entire surface of the crossing. The tenons should be secured by wedges, and the braces screwed into the supports, and together with 1¼-inch screws, the holes being countersunk to admit of the heads being buried in the wood. The material of which the supports are made should be good red deal or oak. The supports need not enter the ground, nor need they be secured to the brickwork behind. It will be sufficient to thrust them under the elm slab that they are to support when it has been put in its place, and having got them upright to screw the elm slab firmly down on them. If the supports are connected at all, it should be by slips of wood running the length of the cellar wall, and notched into them from behind. There must be nothing of this sort in front as a permanent fixture, though slips may be screwed on when fixing them, to keep them a proper distance apart.

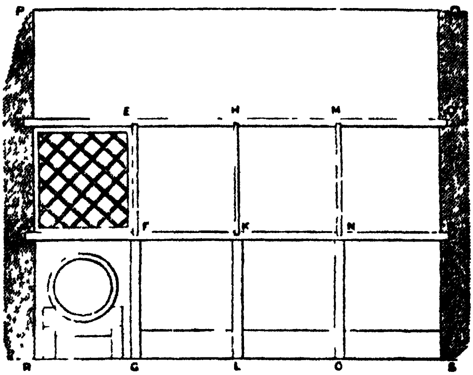


Fig. 117 Mode of Dividing Cellar into Compartments.

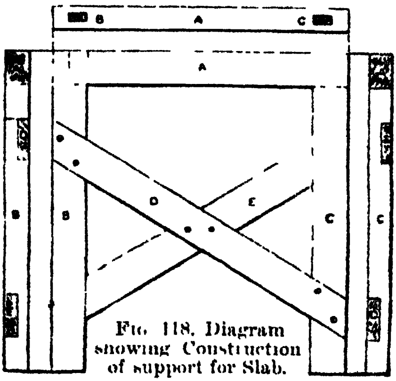


Fig. 118. Diagram showing Construction of support for Slab.

Partitions supporting upper slab.

210 Of course, the places in which the supports, shown in Fig. 117, at F G, K L, and N O, meet, and come in contact with the elm slab that rests upon them, must be carefully determined beforehand, for grooves must be cut in the upper surface of the slab to receive the bottoms of the partitions E F, H K, M N, which act as supports to the upper slab. These

Grooving for partitions in lower slab.

partitions may be made of 1-inch stuff, and solid throughout. The grooves to receive them will therefore be 1 inch wide, and need not be more than $\frac{3}{8}$ inch in depth. The screws that fasten down the slab to the supports below will be driven into the wood in the grooves, and the heads must be taken by countersinking below the bottom of the groove, that they may offer no obstruction when the partitions are driven into the places that they are to occupy.

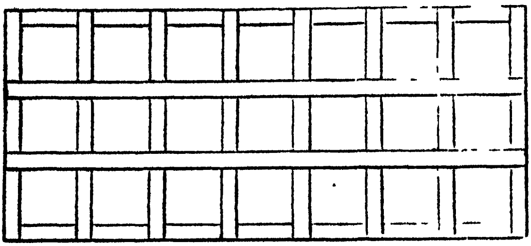


FIG. 119 Wine Bin of Square Lattice Work

Grooving in upper slab, and fixing partitions.

211. The slab C D is grooved in a similar manner on the under side to receive the tops of the partitions. When the slab is settled in position, and the partitions introduced, the latter may be secured in place and kept from shifting by some 2-inch nails driven down into them through the plank above; and the corners at I, K, and N, may be skew-nailed down to the plank below. There is no necessity whatever to have any partitions between the upper shelf and the ceiling, but this must be left to the will and pleasure of the worker. The long space, P, C, D, Q, will serve for the stowage of bottles disposed in racks now to be described, and the four smaller compartments below, namely, C I, L K, H N, M B, will be available for the same purpose. In the compartments below, namely, A G, F L, K O, N S, stands may be made to receive casks; but I would recommend any one who fits up a cellar on this plan, provided there be space enough to admit of it, to lay down pieces of elm in the floor, to act as tramways, or to make the floor of concrete, which is better, and to fit small iron wheels to the legs of the stands, that they may be run in and out with ease at pleasure. It would be a difficult matter to lift a cask on to the stand when in its compartment, but there is none whatever when the stand can be run in and out. When all is finished, the grooves that have been cut in the

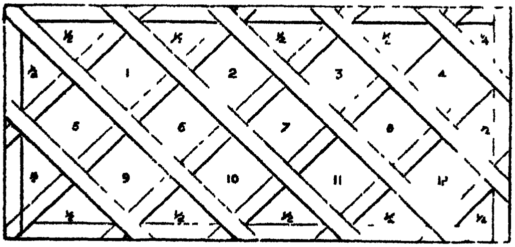


FIG. 120 Wine-Bin of Diamond shaped Trellis

Tramways in floor for cask stands.

brick-work for the reception of the elm slabs must be made good with cement.

212. As a matter of course, the fittings that I have been describing are intended to form a fixture. If a tenant desires to make such a structure, and remove it when he leaves the house, it will be better for him to make *five* supports, so as to have one at each end, as well as three in the middle, and to make C, A, B, D in the form of a case, which can be put together on the supports, and taken to pieces when it is found necessary to do so. In this case the slabs must not be let into the wall, but connected with sides butting against the wall, and acting as additional supports to the upper slab, and the slabs themselves need not be more than 1 inch in thickness.

Adaptation of casing as tenants' fixture for removal.

213. And now for the racks; but before describing these, it will be necessary to consider for a moment or two the size and shape of the ordinary wine bottle the "black bottle," whose unfortunate appearance on the mess table led to the duel between the Earl of Cardigan and Captain Harvey Tuckett in 1840, for which the earl was tried in the House of Lords, and acquitted; to take part, fourteen years after, in the memorable death-ride of the British dragoons, against the Russians at Balaclava. The wine bottle is shown in elevation in Fig. 121, and its average height and average dimensions are given therein, so I need not repeat them here. The necessity for ascertaining them will be apparent directly. As the diameter of the bottle in its widest part is 3¼ inches, it is clear that a bottle may be securely encased in a wooden box whose inside measurement is 3⅜ inches square, or say 3½ inches, and whose depth within is from 7 to 9 inches. If put in such a case, the neck will project, and afford an easy means of withdrawing the bottle from its case.

Form and dimensions of wine bottle.

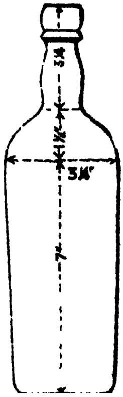


Fig. 121 Dimensions of Wine Bottle.

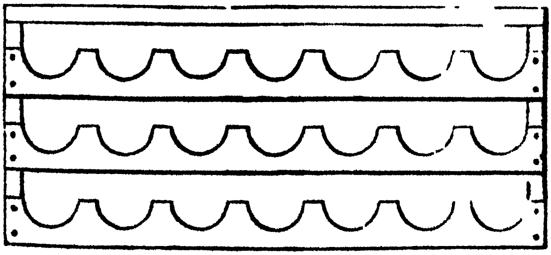


Fig. 122. Cradle or Rack for Wine in Bottles.

214. Now, this at once suggests that a skeleton case, formed of trellis work in front and trellis work behind, let into a frame of wood, formed of top, sides, and bottom, will form a

Old mode of stowing away bottles.

very convenient means of stowing away wine, and one that is very easily made. The old-fashioned plan was to pile the bottles away, two deep if there was any great stock, and in tiers, one on top of another, on the stone shelves of the cellar. This was attended with manifest inconvenience, for it was impossible to withdraw a bottle in any of the lower tiers until the upper ones had been removed, and the weight that the lower tiers had to sustain was sometimes very great. And more than this, as the bottles were brought into close and immediate contact, there was a certain chance of breakage in pulling them away, and withdrawing them from their temporary resting place. The first step towards obviating all this was taken when the iron wine bins were introduced; but as I assume that the majority of amateurs prefer working in wood to working in metal, I am endeavouring to enable them to follow their inclination by describing some wooden wine bins that they can make with ease.

Forms of wooden wine bins

215. In Fig. 120 a bin or case is shown for a dozen bottles, made in the form of ordinary trellis work, arranged diamond fashion. In Fig. 119 another bin is shown in which the lattice work is arranged in the form of vertical and horizontal bars. In Fig. 122 another simple form is shown, which can be made with great rapidity. These will be sufficient for my purpose. Other forms will doubtless suggest themselves to the amateur. Indeed, it is possible to make a very efficient case for stowing away wine, by taking a box—one of the large boxes in which mustard is packed for transmission to the grocers cutting it down, so that its depth within is not more than 6 inches, and then boring or cutting holes 3½ inches in diameter at regular intervals, and opposite each other in both top and bottom, after nailing the top down securely.

Diamond shaped framing for bin.

216. In Fig 120 a rectangular frame must first be made, 31½ inches long and 14¾ inches high, outside measurement, allowing 1 inch as the thickness of the boards used for making it. For this and similar purposes, ham and bacon cases from Canada and the United States, which I have bought for a shilling each, once furnished sufficiently good material; but these cases are not to be had now, and the amateur wood worker who is bent on economy must fall back on organ and piano cases from America and the continent, if he can get them, and the cases in which fancy goods are sent from Germany and elsewhere. The depth of the frame must be 7 inches, or 7½ inches at the utmost. Now make two pieces of trellis of 1-inch square bars, halved into one another, the distance allowed between the bars being 3½ inches, so as to leave diamond-shaped holes 3½ inches square

Construction of framing.

for the insertion of the bottles. Make two pieces of trellis, one for the front, and the other for the back, and make them a little larger than the outside dimensions of the box. When made, lay them on the edges of the box, first the front and then the back, and with a pencil accurately mark where the trellis covers the edge of the frame. Set a gauge to 1 inch, and run a line round the outside and inside of the frame. This line will be 1 inch from the edge. Then with a tenon saw cut out the spaces enclosed by the pencil lines, carrying the cuts down to the lines marked by the gauge. Remove the small blocks of wood between the saw cuts with a chisel. Drop the trellis into its place and screw it down. If the saw cuts have been made, as they should be, *inside*, and just touching the pencil lines, the trellis will fit in tightly. When the trellis has been fitted in front and behind, the case is ready for use. In this kind of bin there is a considerable waste of space, as shown by the fractional figures in the diagram.

Rectangular framing for bins.

217. The case or bin shown in Fig. 119 is made precisely in the same way, but the bars of the trellis are placed vertically and horizontally, thus effecting a saving in space, for the outside dimensions of the case are only 32½ inches by 14½ inches, a very little larger than the case shown in Fig. 120, and there is room in it for twenty-one bottles; but the diamond-shaped trellis, although space is wasted unavoidably that is equal to the room required for the stowage of six bottles, holds the bottles in a position in which they are immovable, and subject to no shaking, however slight. But makers of these bins can take their choice of pattern. They may be extended horizontally and vertically to suit any given space, but it is sufficient for all practical purposes to show how to provide for a dozen bottles. The advantage that these wooden bins present in common with the iron bins over the old shelf system is, that any single bottle can be reached without dislodging others, and they therefore afford the means of stocking a variety of wines and spirits in small quantities within a limited space.

Cradle bin.

218. In making the bin shown in Fig. 122, the method to be adopted is to make a frame as before, from 5½ inches to 6 inches in depth. This frame, to hold twenty-one bottles, is 32½ inches long and 14½ inches broad, outside measurement, the boards of which it is made being, as before, 1 inch thick; then take pieces of ½-inch stuff, 5½ inches wide, and cut a series of holes 3½ inches in diameter in them, leaving a space of 1 inch between the holes and on each side of the holes at either end. Divide these pieces down the middle, so that each piece will supply the part needed for the cradle, before and behind. Nail them on as shown in Fig. 122, and the

bin is complete. It is useful to keep some kind of bin in one part of the cellar as a bottle rack, to receive empty bottles.

219. I have by this time, I think, completely exhausted the subject of cellars and their fittings, having regarded it and taken it from every point of view. My readers, however, must bear in mind that the instructions which are conveyed in the remarks that I have made above in the course of the chapter must not be taken as being restricted to the treatment of cellarage alone, but will be found useful as affording hints on construction for a large variety of objects and purposes. It occurs to me, however, that there is yet something to be said on what may be done in the improvement of cellars; and this I will proceed to describe. It will be remembered that I mentioned in a preceding chapter the cellarage of a house in which there was only one cellar, and that the coal cellar in which one could stand upright; and that the remainder consisted of a space of 4 feet, through which a circuit might be made from the coal cellar under drawing-room, entrance-hall, and dining-room, from the space below which any one making the perambulation would emerge once more into the little space about 6 feet square, and 6 feet or a trifle more in height, by which access was gained from the hall above by a steep flight of steps to the coal cellar on the left, a wooden meat safe, 6 feet by 4 feet, facing the stairs, supported by a dwarf wall about 2 feet high, and a small wine cellar immediately opposite the meat safe, which was used as a photographer's dark room.

Improvement of cellarage.

220. The cellar had been left doorless by "Poor Old Uncle," according to his usual custom of doing nothing more than he could help; and it was a matter of the utmost difficulty to execute necessary repairs under the dining-room, when workman, materials, tools, and light had all to pass, or be passed, through the hole in the wall. All this I resolved to remedy at once; and I sincerely hope that a brief description of what I did will be suggestive and helpful to others. My first care was to make a doorway similar to that which gave access to the coal cellar as nearly opposite to it as possible, so as to obtain proper entrance to the space under the dining-room. This I did by enlarging the existing hole in the wall above, and at the sides and below as far as the ground by removing a portion of the rough wall that hitherto had barred the way. The entrance thus obtained, like that of the coal cellar, was about 6 feet by 2 feet 8 inches. As soon as this was done, strong and substantial frames were at once put into each opening. Doors were ultimately put in the framing, but I will leave the description of these until we come to the special chapter to be devoted to

Framing to cellar doors.

doors. I cleared away sufficient soil in the space under the dining-room to admit of the door opening inwards, and it was my intention to have excavated a space in the centre, leaving a mound of soil, 3 feet wide and 2 feet high, all round, and to have faced the mound all round with 4½-inch brickwork, or brickwork a brick thick; so that the surface of the mound would have afforded a solid shelf for the reception of anything that it might have been desirable to put away there; but many things tended to delay this course of procedure, and ultimately I quitted the house without having carried out my intention.

221. Not so, however, with the space under the entrance, which, I was well aware, was 12 feet long and 6 feet wide, although only 4 feet high; so I commenced operations by taking out the meat safe and taking it to pieces, carefully putting aside the doors with perforated zinc panels for future use. The next step was the removal of the dwarf wall, and the excavation and removal of 144 cubic feet, or more than 5 cubic yards, of earth, which had to be carried up and taken into the road in baskets. One unhappy basket-bearer was told off to do the work, which was not carried out this time by Mr. Gerribilder, and I shall never forget him as he toiled willingly and unceasingly at his task as if he liked it, until every spadeful, both under the dining-room and entrance-hall that it was needful to remove, was taken away. A space, 12 feet long, 6 feet wide, and 6 feet high, was then revealed to view, which was quickly turned into a commodious pantry, which was beautifully cool in summer and tolerably warm in winter. Some light entered through the air bricks under the doorstep already described, and the door at the top of the cellar steps when it was opened.

Excavating soil under entrance hall.

222. As it now stood as a given quantity whose value is known, the cellarage was thus There was a space from stairs to doorstep, 18 feet long, 6 feet wide, and 6 feet high, which was open from end to end, and within —only just within the limits of what we will call the little vestibule, that originally extended as far only as the meat safe, there were two openings; one to the right into the space under the dining-room, and the other to the left leading into the coal cellar. On each side of the space, partly excavated and now wholly exposed to view, was a party wall, which formed a lodgment for the rafters, which ran across the house from side to side, and consequently across the cellarage and the newly opened space. These party walls rested on the ledge of soil in immediate contiguity to that which had been excavated. My first care, therefore, was to have the soil removed to the full width of the party wall, very gradually and not all at once; and as soon as a couple of feet or thereabouts had been taken out, substantial brickwork

Underpinning walls.

was placed in the opening; and when this had been done on each side and along the front, the party walls rested on a sound and solid foundation. This operation is called "underpinning". The rough walls above the new work were then dressed over with a stonemason's hammer, to take off as much of the obtrusive roughness as possible. The dressed walls were then whitewashed, and the place was then left to dry up as quickly as it would. I trust my readers fully realise the position and the general state of affairs with no further aid than that of Fig. 8 which will be found on page 22, as both have much to do with that which will now follow, and which will take the practical form of instruction in carpentry.

Members or parts of door frame

Architrave, jambs, and sill.

223. I have said that for the doorway into the coal cellars and the cellar space on the opposite side stout door frames were made. Let us look at the construction of these door frames, for doubtless the home carpenter will sometimes be called on to make a door frame for some building that he is putting up. Now, the members or parts of a door frame, or door case, are four in number; namely, the two jambs or side posts, from the French *jambe*, a leg, the architrave or lintel, which is the top or principal horizontal piece of wood which surmounts the legs; and the sill or lowermost member which lies between the jambs at the bottom, and into which the jambs are sometimes notched or tenoned. Of these three are absolutely necessary, namely, the jambs and architrave; and the fourth is sometimes used in situations such as I am dealing with, but never in door frames which give access to rooms, etc., because its existence would in such cases be an obstacle to progress, and an intolerable nuisance to those who entered through the doorway and those who went out. For the sake of strength and stability, and because I wished to lower the surface of the soil by 3 inches in the vestibule to give a little more headway, and so could use the sill as a step to the slightly higher level within, I made my frames with sills. I always have, or try to have, a good reason for everything that I do in this way; and if at any time I omit to explain my reason for any peculiarity of construction, or departure from the usual form or generally recognised way of doing things, I trust my readers will try to fathom it.

Construction of door frame.

224. That the whole mode of procedure may be thoroughly understood, let us now have recourse to a diagram; but let me first say that the diagram exhibited in Fig. 123 is not drawn to scale, but is merely intended to show the general principle of construction adopted in making a door frame, and the system I followed in making mine. My doorways, it will be remembered, were 6 feet in height and 2 feet 8 inches in width.

My door frames, therefore, had to be made of the same height and width over all, that is to say, from outer edge to outer edge of framing, both in length and breadth. But it was my intention to lower the floor level in the vestibule by 3 inches; therefore I had to make my door frames 6 feet 3 inches in height and 2 feet 8 inches in width over all as shown. For the sake of those who may be puzzled by the dashes or accent marks to the right of the numerals, let me explain that in all diagrams involving dimensions, one mark or accent (′) implies feet, and two marks or accents (″) implies inches. I used for my door frames or door cases stuff measuring 4 inches by 2 inches, or, strictly speaking, 4½ inches by 2 inches, and thus the inner measurement of the frame was 5 feet 10 inches in height by 2 feet 4 inches in width, the sill being thicker by 1 inch than the other three members, or 4 inches by 3 inches. For the jambs I cut two pieces, 6 feet 6 inches long, and for the architrave and sill, two pieces 3 feet 2 inches long. This was in order to leave projections or horns, as they are sometimes called, 1½ inches long at top and bottom of the jambs beyond architrave and sill, and 3 inches long beyond the jambs. When the frame was finished and ready to put in position, the ends of the tenons at A, B, C, and D were sawn off, and the projections at E, F, G, H, were let into the brickwork. The diagram shows the front elevation of the door frame, and consequently the thickness of the stuff used, which, it will be remembered, was 4½ inches by 2 inches.

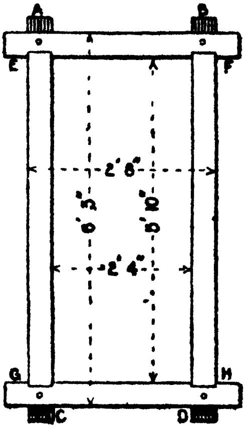


FIG. 123. Construction of Door Frame.

Dimensions of parts.

225. Having cut the different parts of the required length, the next thing that was done was to mark off with rule, square, and pencil, the mortises or parts that had to be taken out in architrave and sill, to receive the tenons that had to be cut in the ends of the jambs or side posts of the frame. Now, as these are all treated in precisely the same manner, and are all of the same size, excepting that the tenons for the sill are longer than the tenons that enter the architrave, the example given in Fig. 124 of the treatment of the right-hand corner of the door frame will suffice for all. The diagram itself is drawn to a scale of ⅛ inch to 1 inch, or 1½ inches to 1 foot. In the diagram, A represents the front elevation, and B the plan of the end of the architrave, and C the front

Connection of parts by mortise and tenon.

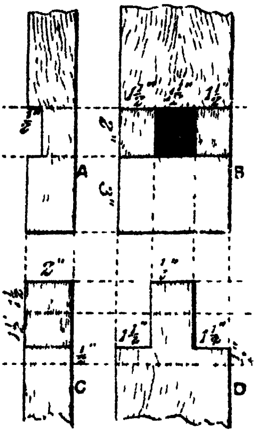


FIG. 124. Mortises and Tenons of Door Frame.

elevation, and D the plan of the upper end of the jamb. Commencing at the end of the architrave, which was planed up and trued on its outer and lower faces, a distance of 3 inches and then another of 2 inches were marked off, and straight lines were marked off along the inner face. The gauge was set to ½ inch, and pencil marks, having been made on front and back of architrave in continuation and correspondence of the straight lines already made on the face, were marked with the marking gauge along the front and back of the architrave at ½ inch distance from the edges of the lower surface, and across the pencil marks. Two saw kerfs were then made in the lower face of the architrave to the depth of ½ inch, as indicated by the gauge mark, so as to leave the pencil marks unbroken and still visible, and the wood between the saw kerfs was carefully removed with a chisel, and the notch thus formed was reduced to the same level throughout. This was done at both ends of architrave and sill.

Mortises in architrave

In this notch or groove straight lines were then marked across it at 1½ inches distance from the edges of the groove, and the intervening space, 2 inches by 1½ inches, was cut out through the material as a mortise to receive the tenon yet to be cut at the end of the jamb. When this had been done at the other end of the architrave and each end of the sill, both architrave and sill were laid aside. The object of the notch or groove and consequent shortening of the longer part of the tenon in the jamb was to admit of the entire width of the jamb entering both architrave and sill to the depth of ½ inch, and by thus gripping the jamb between the shoulders, produced by the cleavance of the wood to form the groove to ensure the squareness of the frame, the parallelism of the jambs, and to give additional strength to the framing throughout. When a door frame is being made without a sill, pieces of wood should be nailed across in a slightly diagonal direction from jamb to jamb to preserve parallelism between the jambs throughout from architrave to lower ends

Tenons in Jambs.

226. The jambs were then taken in hand, and pencil lines ruled by aid of the square, as in the architrave, at 1½ inches, 3 inches, and 3½ inches from the extreme end of the jamb, the inner face and outer face of the jamb having been planed and trued up as in the case of the architrave. The marking gauge was set to 1½ inches, and lines were marked at

this distance across the pencil lines on the broader faces of the jamb. Saw-cuts were then made along the *second* pencil mark on each side of the jamb to the depth of 1½ inches along the narrow faces, and then other saw-cuts were made along the lines traced by the marking gauge until they met the saw-cuts first made transversely in the jamb. The removal of the pieces thus sawn out left the tenon required in its complete form and of the proper dimensions. Thus it will be seen that the cutting of the tenons was no very difficult matter, and that in point of fact a double tenon to a certain extent was obtained. Sometimes a little easing with a chisel will be found necessary, but I generally manage work of this kind myself in such a manner that the joints fit closely and tightly without much trouble of this kind. If a tenon be cut too loose, it must be wedged up, and this may be done best if the tenon be very loose by driving in thin wedges on each side of the tenon and so packing it. As far as I am concerned, I generally make a saw-kerf across the centre of the tenon the way of the grain, and insert a very thin wedge to prevent any tendency to draw through shrinkage or other causes; or if the tenon be a very wide one, I make two saw-cuts in it, the way of the grain, one on one side and one on the other, a little distance from the edge, and insert the wedges there. Care should be taken not to drive them in too far, but only to a sufficient extent to lock the tenon, as it were, securely into the mortise. Every part of the frame being now ready, the sill is placed conveniently for the insertion of the lower ends of the jambs and the lintel for the upper ends, and both lintel and sill are driven home against the shoulders of the tenons with the mallet. Trial is then made by applying the square to the inside angles of the frame to see that all is right, and that the jointings have been done truly and in a workmanlike manner. Lastly, the wedges are driven in and the ends of tenon and wedges are sawn off close, and the frame is ready for fixing. It must not be taken for granted that every door case is made in precisely the same way; but the amateur wood worker will soon see how to modify procedure to circumstances. I have described the making of a door frame under the circumstances described, and modifications will readily suggest themselves. There is one thing, however, that I have omitted to say, and that is, that when the tenons are placed in position and wedged up, holes should be made through the *centre* of side of mortise and tongue of tenon with a taper bit in the position shown in Fig. 125, and wooden pegs driven into the holes thus made. The hole should not be made

Fitting together.

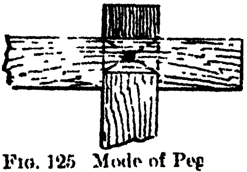


Fig. 125 Mode of Peg Tenon

with too large a bit. The object of making the holes with a taper bit is that if any necessity arises for driving out the peg it may be done all the more readily by striking it with a punch or peg at the smaller end.

Putting frames in place and fixing them.

Wedges between frame and wall.

227. And now as regards putting the frames in place and fixing them; the brickwork was first cut away as far as was necessary to admit of the entrance of the horns, and then the frames, first one and then the other, were put up. As might have been expected, some inequalities in the entrance to the coal cellar had to be cut away to admit of the entrance of the frame, and the sides of the enlarged hole in the wall had to be built up against the frame, wood bricks being introduced at two places in the sides to which the frame was nailed Plugs were driven into the sides of the entrance into the cellar, and large nails were driven through the door frame into these to hold the frame tight and keep it in position. The condition of the ceiling has been described already. There was no ceiling in fact for the rafters, and the lower surface of the floor boards that were nailed on them were visible wherever the eye turned, so the heads of the door frames were driven tightly up against the rafters above, and the lintel or head-piece was finally screwed up well to the lower surface of the rafter, or in my case, to an inch board that had been nailed to the rafters across the place where the head of the door frame came, the board being of the full width of the brickwork. The reason for this will appear presently. Where a door-case is not built in, as was the case with the frame in the doorway of the coal cellar, the frame has to be steadied and kept in place by driving in wedges between frame and wall. Pairs of wedges are used which are inserted edge to edge, and driven one over the other till a sufficient degree of tightness has been obtained. Fig. 126 will make it perfectly clear how this is done. In this A is the wall in section, B the door case, and C D the wedges. To drive in a single wedge is useless, because in this case the wedge would only bear against wall and frame at the line of contact; but by using two wedges as shown, contact is secured with wall and frame to the entire width of the door frame.

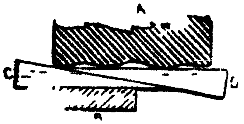


FIG. 126. System of Wedging between Wall and Door Frame.

Plumb level and plumb bob.

228. But how are we to know that the door frame is accurately adjusted, or, in other words, that the frame is upright? This is known by aid of an appliance known as the plumb level, an appliance which every amateur wood worker should possess, and may easily make for himself. The plumb level is a piece of wood about 6 feet long, 4 inches wide,

and from ⅞ inch to 1 inch thick, which has been truly and accurately planed up, and whose edges have been truly shot, so that they are parallel and perfectly level throughout the entire length of the wood. A pear-shaped hole is made near the lower end of the wood as at A, a straight line having been first marked right down one of the broader surfaces of the wood from B to the centre of the lower edge, B being the centre of the upper edge. The hole at A is so made that this line coincides with the central line of the hole, which is cut symmetrically on each side of it. A straight saw-kerf is made at B, and two more saw cuts inclining inwards, one on each side of it. A piece of string or cord about the thickness of whipcord is then passed through the central hole made longwise for the purpose in a leaden weight or plummet, round or globular below and conical above, and the other end of the string is then passed from the front into the saw cut at B, and then through the saw-cuts on each side of it. The string must be so adjusted with regard to length that the plummet swings freely in the hole that has been cut in the board. Plummets or plumb bobs, as they are usually called, may be had in brass as well as in lead, and cost from 1s. upwards, according to size and weight or materials of which they are made. It must be borne in mind that the string, when the plumb level is placed upright, hangs exactly over the central line already marked down the centre of the board, or at all events ought to do so, and that the top of the plummet should be about ¼ inch below the top of the hole cut for its reception.

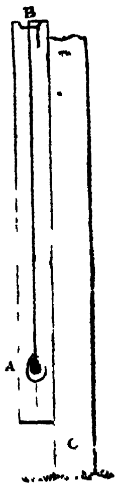


Fig. 127.
Plumb Level.

Application of plumb level.

229. Now with regard to the manner in which the plumb level is used, let us suppose that the amateur wood worker is using it for any of the numerous purposes in which it may be made available for purposes of adjustment, whether it be in getting a door frame accurately in position, or fixing an upright against a wall, or setting a post upright in the ground. If when the plumb level is applied to a post as shown in Fig. 127, the plumb bob, when at rest, is in such a position that the string covers the central line marked down the board from top to bottom, the post or upright, be it what it may, is perpendicular. If the post or frame is too forward at the top, the plummet will carry the string to the left, or outside the central line; but if the top be too far back, the string will incline to the right, or inside the central line, and in either case, door frame or post must be brought forward or moved back as the case may be, until the post

has been worked into a right position. In the case of a post let into the earth, it is necessary to try it with the level on two contiguous faces to ensure accuracy of position with regard to its being perpendicular.

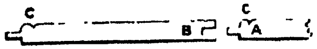


FIG. 128. Match-boarding in Section.

230. I said above that I had pieces of board nailed to the rafters, against which the lintels of the door frames might butt. This necessarily drove the bottom of the sills an inch further into the soil below; but this was rather an advantage than otherwise, because it enabled me to make the floor of the vestibule an inch lower than it otherwise would have been, and also to allow for the thickness of the match-boarding with which a ceiling was formed over pantry and vestibule by nailing it to the rafters. This was eventually painted white, and this rendered the pantry all the lighter by the rays of light which the white surface reflected. If the nature of match boarding is not yet known to any amateur wood worker who may read this, let me say that it is furnished with a tongue on one edge and a bead and groove on the other, into which the tongue of the board that comes next in is inserted. Its character will be fully understood from the section given in Fig. 128, in which A represents the tongued edge of a board in position for entering the grooved edge of the next board at B. This board is shown in full, and the beads used for the purpose of breaking the joints are clearly apparent at C C. Match-boarding is useful for a variety of purposes, as all amateur wood workers will find sooner or later.

Match-boarding in ceiling.

231. The next step was to put up the partition which was to separate the pantry from the vestibule, and to contain a door which would afford access to it. This partition is shown in Fig. 129. In the first place, some quartering was obtained, 2¼ inches by 2 inches, and from this a head piece was cut, 6 feet in length, and four studs, or uprights, about 6 feet 6 inches long, or rather more, to allow them to enter the ground, for a few inches below the level of the floor when this portion of the work was completed. These were halved into the head-piece at A, C, E and B, and pieces 1 foot 9 inches long into the studs, as shown at H K, L M, N O, P Q. The halvings are indicated by the dotted lines. This left a space of 2 feet 6 inches between the studs C D, E F, which formed the doorway into the pantry. Transverse pieces were nailed across this framing from A Z to B G, in order to keep any part of it from displacement while it was being fixed. A strip of wood was nailed along the match-boarding within A B for the head piece to butt against, and after the halved joints had been screwed together and holes made for the

Partition between pantry and vestibule.

reception of the bottoms of the studs, the framing was lifted and forced into position. It was by no means an easy job, but by coaxing the rigid framing and cutting away any slight projection in the wall that hindered progress in fixing, it was accomplished at last. The head piece was then screwed up firmly to the match boarding and rafters above, care having been taken to mark the position of the rafters on the match boarding as each successive board was put up. Further, the walls on each side had been plugged, so as to admit of the studs, A Z, B G, being fixed to and against the wall with stout nails, those used being long and strong wire nails about 5 inches long, the wood being slightly countersunk with a rose bit to bury the heads of the nails in it. If it is asked why the partition was not completed before it was put into its place, seeing that it is easier to do this than to build up a partition bit by bit, I can only point out that the difficulties of fixing, one of the most important points in the matter, would have been materially increased, as any one who will take the trouble to think may easily see.

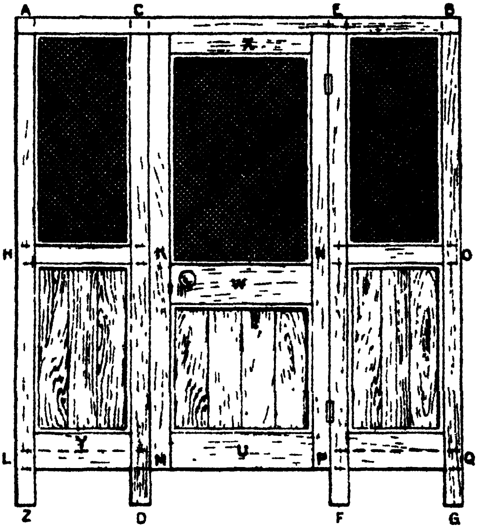


FIG. 129 Front Elevation of Partition between Vestibule and Pantry.

Filling side panels.

232 It will be understood that all the parts of the framing had been run over with the jack plane to an extent just sufficient to render painting comparatively an easy matter, before the parts were halved and jointed together. When the fixing was completed and the holes into which the lower ends of the four studs had entered had been filled up and tightly rammed, I proceeded to fill up the side-pieces of the partition. In the upper panel, round the inner edge and flush with the back of the framing, I nailed slips ½ inch thick and 1 inch wide, against which I placed a panel of perforated zinc that had done duty in one of the doors of the old meat safe that I had taken away to admit of making the pantry. For the other side I got a new piece, as I wanted the other door to serve as the upper panel of the pantry door. Having cut the zinc exactly to the size of the opening between A C, C K, K H, and H A, I butted it against the strips I had just nailed

to the inner surface of the framing, and secured it in its place by other slips barely 1 inch in width and rounded in front. I did precisely the same on the other side, and the upper panels were then completed. The lower panels were filled in in the same way with pieces of board ½ inch thick. First of all I nailed strips about ⅞ inch square round the lower panels, flush with the inside, and then nailed the boarding against them. This done, there was a space of ⅜ inch left round the inner edge of the panel, so I finished it by nailing strips of this width and ½ inch thick round the outer edge of the lower panel. Before doing this, however, I had let in a piece of wood at Y, about 4 inches wide and ⅝ inch thick, flush with the studs and the cross-piece, L M, and had skew-nailed it to the parts just mentioned, and on top of this I nailed the lower transverse piece of beading. I made no attempt to hide the joints, but contented myself with rubbing them down and taking off any slight inequalities at the joints with sandpaper. The joints were very close, and in fact were sprung in, that is to say, the three boards were cut full, and when one had been put in place, the remaining two were placed slanting slightly outwards, with the lower edges in close contiguity. Fig. 130 will show what I mean. The board A is first placed in position, and the boards B and C are then placed as shown. Great pressure is then applied to the projecting edges of B and C, and they are forced into place flat against the strip behind at their upper and lower ends. The diagram is slightly exaggerated, but the reader will at once understand from it what is meant by "springing in". And thus, when the beading was nailed on, the sides of the partition were finished.

Springing in.

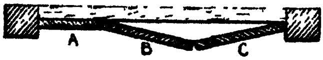


FIG. 130 Springing in.

Pantry door.

233. Instead of leaving the door to be dealt with in a future chapter, I think I had better describe it here at once, and so bring what I have to say about the partition in particular to a close. It was a queer door, but the exterior would not in any way reveal the manner in which it was made. The door of the old meat safe that I had reserved intact was 3 feet 6 inches long, 2 feet 6 inches wide, and 1 inch thick, and the perforated zinc had been nailed to the inner side of the frame, and a narrow slip of wood covered the edge of the zinc. This I removed, and turned the door, so that what had been the back of the door was now in front. The frame was about 2½ inches wide, so I took strips of wood battens, in fact, of this width, which were cut for the purpose; and having planed them over, I screwed them hard and fast to the styles or uprights of the frames, after cutting them to the proper length, which was about 6 feet 1 inch. These were the

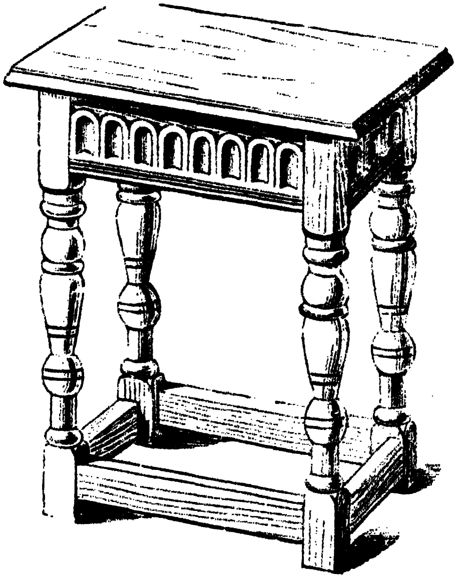
styles of the entire door shown at K and N. I then screwed to the frame of the door of the meat safe at the top the *quasi* rail X, and then to the inner surface of the styles K N, boards of the same thickness as the old frame, transversely placed, until the bottom of the styles at M P was reached. These were planed over on the inner surface of the new door; and the bottom, as indeed were all the edges of the old door of the meat safe, was planed up, so that the junction was effected as nearly as possible. All this inner work was put together with dowels made of wire nails as each successive board was put on. To these and to the lower members of the old door, the pieces W and U, each about 6 inches wide, were screwed, provision having been first made for the insertion of a narrow mortise lock at the place shown. On to these some ½-inch boards were sprung in the manner adopted for the side panels. This done, some strips of the requisite width and thickness to correspond with the beading of the side panels were nailed to the inner edges of the framing thus made round the zinc panel above and the wood panel below, and the door was completed. As the door for convenience sake opened outwards, stops were formed by nailing strips of wood to the inner surface of the head-piece, and the studs C D, E F. The door was a substantial one, more so indeed than was absolutely needed; and if a new door had been made instead of the made-up door of old materials, it would have been lighter. However, it served its purpose admirably, and I daresay its construction will serve as a hint to many who would be unable to make a framed panel door in the usual way; for to do this requires a little more skill and practice than the average amateur has.

Shelves in pantry.

231. But little more remains to be said about my cellar-pantry, and this has respect to its completion. It required shelving; and my first step was to screw strong cleats to the inner face of the studs A L and C M, E F and B G, just below the lower edge of the rails H K, N O, in Fig. 129; and as I had determined to make my shelves 15 inches wide, I placed strong bearers at intervals of 4 feet on each side, letting the ends of the standards into the ground, and notching the rails which were to carry the shelving on to the top of the standards. Further, I let the ends of the bearers into the wall, and nailed the free ends on to the standards. At the further end of the pantry I placed two more standards and bearers, bringing the bearers just under the edge of the farther end of the shelving, and pointing towards the door. I did this that these bearers at the end of side shelves might sustain the ends of the piece of transverse shelving that lay at the further end of the pantry. I rebated the edges of the side shelves, and

notched the ends of the transverse piece, and dropped it in on the rebates, making it fit as tightly as possible. I then put on the shelving, which consisted of floor boards, 6 inches wide, two and a half on each side. The shelving was firmly nailed to the bearers, and this part of the work was completed. Lastly, the earth floor was levelled and cemented with a solid coating of this material in equal portions of cement and good road sand. Being under the ground level the cement took some time to dry out; but when this was accomplished, the pantry furnished not only a suitable place of deposit for all eatables cooked and uncooked, but a cool storage for ale and vegetables of all kinds after purchase.

Cement floor.



Joint Stool.

CHAPTER VII.

HOW TO IMPROVE OLD DOORS AND HOW TO MAKE NEW DOORS.

Different Kinds of Doors Construction of Four Panel Door Names of Different Parts: Rails—Styles and Muntins, Panels—Principle of Construction in Doors—Mouldings and Stops Principle of Construction in "Bead Flush" and "Bead Butt" Doors—Improvement of Plain Doors Insertion of Mouldings Mitre Block and Mitre Box Griffin's Registered Mitre Machine—Nailing on Mouldings—Direction in which to Drive in Brads Rule for Bradding on Mouldings Treatment of Bead Butt and Bead-Flush Doors Mode adopted for Relieving Surface Description of Mouldings used Small Mopstick Moulding round Glass Beaded Moulding round Lower Panels Variations in Style of Treatment Definition of Remarks on Ledge Doors Construction of Ledge Door explained Alternative Mode of constructing Ledge Doors Mocking—Panel in Mocking Construction contrasted with Framing—Exterior Treatment of Ledge Door by Mocking Determination of Width of Panels—Setting out Spaces on Door Treatment of Head and Foot Boards Beading or Chamfering Mocking—Tenons in Styles and Recesses in Head and Foot Boards—Ledge Doors in Cellar—Chamfering and Stop Chamfering Contrivance for holding Board in Chamfering Edge—Alternative Clamp for holding Stop-Chamfered Work—Advice to Home Carpenters on Treatment of Doors.

235. THE treatment of doors naturally resolves itself into two branches, namely, the improvement of old or existing doors, and the manufacture of new doors. The amateur wood worker as naturally will wish to know how to manage these things in the simplest and easiest possible way; and this I will endeavour to point out to him. We will take the improvements of old or existing doors first of all; but before we can enter on this branch of our subject, the home carpenter must try to understand the difference that exists between the various kinds of doors that are made and put into dwelling houses. The plainest kind of door and by far the easiest kind of door to make is the *ledged door*, but we will leave this for the present, as it is to the ledged door that I chiefly wish to direct the attention of the amateur, because taking it as a foundation it is capable of being finished in such a way as to form the prettiest doors imaginable externally, and doors by no means objectionable internally. Everything depends on the treatment, as we shall see presently. The *panel door* is the door commonly used in the interior of buildings; and of this there are many varieties distinguished by the number of panels they contain. Thus there is the *one panel door*, consisting of a single panel in a frame; a *two-panel door*, in which there are two panels, an

Different kinds of doors.

upper one and a lower one, separated by a rail running across the door from side to side, and forming part of the framing; a *four-panel door*, in which four panels, smaller in size, are used instead of two broad ones, the panels being divided by the cross-rail in the middle, and two vertical pieces connecting the upper and lower rails and worked into them; a *six-panel door*, a form only used for large, high, and fairly heavy doors, in which there are two cross rails, so to speak, and the topmost panels are small panels very nearly square, if not quite so; *folding doors*, plain or arched at top, which being large and heavy doors, are usually six-panel doors, and which are used between two rooms which may thus be kept separate or thrown into one at pleasure. To go into all the variations in doors is impossible, as the reader would soon know and feel if he glanced at those pages of *Lockwood's Builder's and Contractor's Price Book* which deal with these things and the prices paid for making them. I must, however, mention the *sash door*, in which the upper panels are glazed, and which are used in separating vestibules from entrance halls, in doorways affording access from rooms to verandahs, balconies, or gardens, and for glazed structures, but which must not be confounded with French windows, which are also used as means of communication between the room within and the verandah, balcony, and garden without, as the case may be. *Cloth-covered doors*, designed to deaden sound and to stop draughts in passages, making rooms and parts of houses more snug and private than they otherwise would be, I must leave untouched; but I am compelled to call attention to the doors as *bead butt* and *bead flush* doors, the mysteries of which I myself have scarcely yet fathomed, but which I think I may define as having the exterior of the panels flush or even with the frame, the distinction being that in the *bead flush* the beading runs all round the panel, top, bottom, and sides, whereas in the "bead butt" the beading is confined to the sides of the panel. I will not attempt to burden and bewilder the mind of the reader with more about forms of doors than is contained in the discourse delivered above, and from which I fear some of my readers have sought to be released in a form of words to be found in the Litany.

236. I do not wish to be in any way troublesome or didactic, but I think it is desirable that the home carpenter should understand the construction of a four-panel door, for if he can arrive at a clear perception of this the art and mystery of door-making will puzzle him no longer. He shall have a look at a four-panel door in separate pieces before the parts are put together, and then he will see at a glance how doors of all kinds which are framed doors, or which consist of framing and panels, are made.

Construction of four-panel door.

Names of different parts: rails.

Styles and muntins. panels

Let us first learn from Fig. 131 the names of the different parts of which the door consists. There are, all told, eleven pieces: four vertical, of which two are long and two are short; three horizontal, all of the same length; and four broad, flat, thin, rectangular pieces, of which two are larger and two smaller. Technically these are known, the vertical pieces as styles and muntins, the horizontal pieces as rails, and the broad rectangular pieces as panels. Now let us get a step farther: we will begin with the rails. Of these A is called the top rail, B the middle or lock rail, because the lock, if a rim lock, is screwed on to it, and if a mortise lock is let into it through the framing, and C the lower rail. Here I may pause a moment to say that in panel doors generally the framing in every part, except the lock rail and bottom rail, is 4½ inches in width, but the middle or lock rail and the bottom rail are 8½ inches wide. In six-panel doors there is, as a matter of course, a fourth rail between the top rail, and the lock rail; this is called the frieze rail, and is of the same width as the top rail. Going on a step further the longer vertical parts of the framing D and F are called the styles, and the shorter central pieces E and G are called the muntins. It must be borne in mind that the two styles are known, the one as the *hanging* style, and the other as the *falling* style; but it is not possible to say which is which until the door is placed in the door frame for hanging Then the style to which the hinges are attached is the hanging style, and the free style which falls against the stop attached to the door case when the door is closed is the falling style. All of these are 4½ inches in width, and ordinary doors. Lastly, there are the panels, H, I, J, K, which are usually ½ inch in thickness, although in substantially-made heavy doors they are as much as ¾ inch thick. The thickness of the rails and styles ranges from 1¼ inches in light doors to 2 inches in strong heavy doors. In bead butt and bead flush doors in which the construction is somewhat different, as will be shown presently, the panels are 1 inch and upwards in thickness.

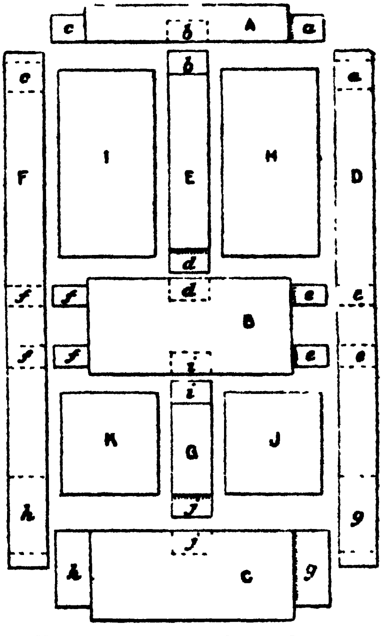


FIG. 131. Parts of a Framed Door.

Principle of construction in doors.

237. Looking at Fig. 131, it will be immediately recognised that all the parts are in proper juxtaposition, and are arranged in the positions they would relatively occupy before the tenons of the rails and muntins are inserted in the corresponding mortises in the styles and rails, and the edges of the panels fitted into styles, rails, and muntins, which are grooved to receive them. An inspection of the diagram will show that tenons must be cut at *a* and *c* in the rail A; at *e e'* and *f f'* in the rail B, and at *g* and *h* in the rail C. These tenons fit accurately into mortises cut in the styles to receive them, which are indicated by the same letters, namely, *a e' e* and *g* in the style D, and *c f f' h* in the style E. Tenons are also cut at the ends *b* and *d*; *i* and *j* of the muntins F and G respectively, which fit into mortises similarly lettered in the rails A B C. Grooves about ½ inch in depth must be ploughed in the *inner edge* of the two styles, and the top and bottom rails, and in *both edges* of the middle rail, and the muntins to receive the edges of the panels, which must be made 1 inch longer and 1 inch wider than they appear to be when the parts of the door are put together and fastened up. The width of the grooving is of course regulated by the thickness of the panel. This is clearly shown in Fig. 132, which is a section of the door across the upper panels I and II, and the styles and muntin D E F. In doors for offices and ordinary places and purposes, nothing more is done; but in doors for houses it is usual to finish the inside of the door, that is to say, the side which is seen from the room to which the door is fixed with a moulding, as shown in Fig. 132, and on a larger scale in Fig. 133, in which A is the style in section, B the panel, and C the moulding. It should be of such a thickness as to be flush with the styles and rails in its thickest part. As the doors of rooms as a rule open inwards, the stops must be affixed to the door frame on the outside. It may be said, as a general rule, that all doors, whether of rooms or of cupboards, open into the room. Thus far the doors of rooms and cupboards are similar; but in one respect they are not similar, and that is in this, that whereas the room door opens *inwards* into the room to allow of ingress or egress, as the case may be, the door of a cupboard opens outwards from the space enclosed and shut in by the cupboard door or doors and their frame, so as to give a more ready means of access to the interior of the cupboard, and those things which have been placed in it.

Mouldings and stops.

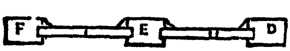


FIG. 132. Section of Four-Panel Door.

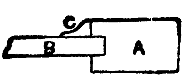


FIG. 133. Moulding in Panel.

238. I have spoken of "bead butt" and "bead flush" doors, which

certainly have the merit of strength, although I do not admire the appearance they present. These modes of making are frequently adopted for entrance doors for which more strength and power of resistance is required than is generally looked for in ordinary house doors. From Fig. 134 it will be seen that the rails and styles are made and grooved for the reception of the panel as at A; but that the panel itself, instead of corresponding in thickness to the width of the groove only, is as thick as the groove itself, and the projecting tongue on one side of it when taken together. Thus, if the groove be ½ inch in width, and the style A be 2 inches thick, the thickness of the panel will be ½ inch + ¾ inch = 1¼ inches. The edge of the panel is rebated as shown at B, in order to form a tongue for insertion into the groove, and a bead is run along the vertical edges of the panel as at D. The moulding that is laid in the right angle formed by the inclination of the edge of the style and the surface of the panel is shown at C. The difference in the external appearance of the panels of doors constructed on this principle is shown in Fig. 135. In the bead butt door the bead is carried right round the edge of the panel as shown at A, so that the bead butts against the edge of rail and style all round; and the surface of the panel itself, and the highest part of the surrounding bead, is in the same plane as the surface of rail and style. In the bead flush door, there is no bead whatever along the upper and lower edges of the exterior of the panel, and therefore no break, the surface of panel and rail being continuous.

Principle of construction in "bead flush" and "bead butt" doors.

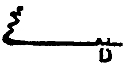


FIG. 134. Form of Panel in Bead Butt and Bead Flush Doors.

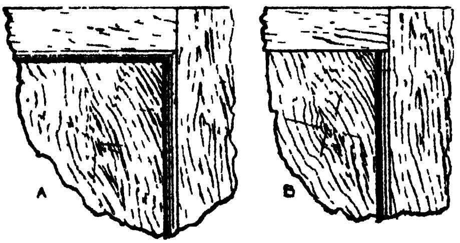


FIG. 135. Corners of "Bead Butt" (A), and "Bead Flush" (B). Panels as shown on Exterior of Door.

239. I think the general principles that govern the construction of doors that consist of framing and panels will now be clear enough to the reader, and I can proceed at once to describe the steps that I have taken to improve the appearance of doors. When I became the owner and occupier of the house that "Poor Old Uncle" built, I found every cupboard door throughout the house, excepting the dwarf cupboards in one of the rooms on the ground floor and another on the first floor, utterly destitute of moulding. Now, plain doors without mouldings having a naked unfinished

Improvement of plain doors.

look, are always objectionable to me on this account; and as room after room came to be newly painted and papered, I took good care to remedy this state of things by doing that which "Poor Old Uncle" had evidently thought a work of supererogation. The inside of the kitchen door and the outside of the kitchen cupboards were the first to be done, and I obtained a quantity of mouldings from the nearest dealer in timber and fittings of all kinds, and set to work accordingly. Any one who attempts to carry out work of this nature must have a tenon saw, a mitre box, and sharp chisel. Two of these articles the amateur wood worker will doubtless possess, but he may not have any appliance for cutting mitres. I will not waste time in describing and recommending such costly appliances as the "New Langdon Mitre Box," and the "New Langdon Mitre Box Improved," which cost from 36s. to 52s. each, nor even "Booth's Improved Mitre Cutting Machine," which costs 12s. 6d., and 23s according to size; but I will content myself with mentioning and giving an account of two kinds, which have at all events the merit of being cheap and useful. These are the mitre block or box, and Griffin's Registered Mitre Machine.

Insertion of mouldings.

Mitre block and mitre box

240. The mitre block is shown in Fig. 136. It is nothing more than a block of beech, carefully squared and trued up and rebated, so as to present throughout its length a rectangular step like recess, in which the wood to be mitred is laid before it is cut at the necessary angle. In the raised part three saw kerfs are made, two at an angle of 45°, with the back and front of the raised part of the mitre box, and one in centre of these at right angles with the same parts. Of these saw-cuts A and B are each at an angle of 45°, but their inclination is reversed, because in any mitred joint, the object of which is to bring the pieces in juxtaposition truly at right angles to each other, the end of one piece has to be cut one way by bringing the saw to bear on it through B, and the other by doing precisely the same thing through A. If the saw-cuts have been cut at a correct angle the mitre joint will be correct; but if not, the result will be disappointing and disastrous in the extreme. Care should, therefore, be taken to prove the mitre block, and see that it is capable of carrying out the work it is supposed to effect with truth

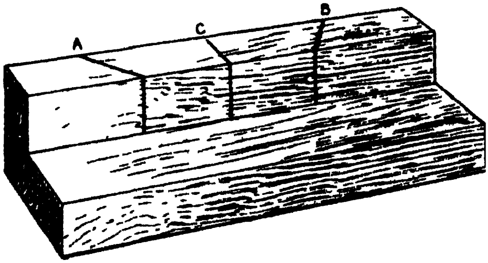


Fig. 136. Mitre Block.

and accuracy. The rectangular saw cut at c is mainly useful in squaring up the end of any strip of wood or rod of any form, and in testing the accuracy of the mitre joint made by means of the diagonal cuts. If a trifle out, the ends of the contiguous pieces should be pared, *quantum suf.*, with a sharp chisel until they are fairly adjusted. Mitre blocks of beech, as shown in Fig. 135, are made 9, 12 and 16 inches in length, and are sold at 1s., 1s. 3d., and 1s. 9d. respectively. Many possibly think that a mitre block and a mitre box are one and the same thing; but a mitre box is, properly speaking, a trough of wood or metal composed of a bottom piece and two raised sides, in which saw-cuts are made transversely through each side, and through which the tenon saw has to move backwards and forwards until the necessary cut has been effected. The mitre box such as I have described it to be is to be preferred as a saw guide in cutting mitred joints to the mitred block. Their price ranges from 4s. to 20s. each.

241. GRIFFIN'S REGISTERED MITRE MACHINE is an excellent little appliance, and most useful in cutting mitre joints for mouldings, and in making small picture frames, that is to say, picture frames of mouldings that come within the capacity of the machine. It costs only 4s., and therefore cannot be regarded in any way as a costly machine or appliance when its utility is considered. Its nature is shown at once by a glance at Fig. 137, in which it is shown when employed to cut or pare the end of a piece of mitred moulding. Its base (Fig. 138) consists of an iron framing which is bolted or screwed down to a piece of wood with a cleat at one end which is hooked on to the bench, and resists any tendency to move forwards when pressure is applied to the chisel. From the base and at an angle to it of 45° rises a framework of iron, with grooves in front in which the chisel works. The framework is connected by a strong tie at the top under which the chisel passes, and through which a screw with a looped head works when the machine is used for cramping a frame when nailing the mitred joints together. The chisel is held in the right hand of the operator, as shown in Fig. 137, and the material to be cut is passed through

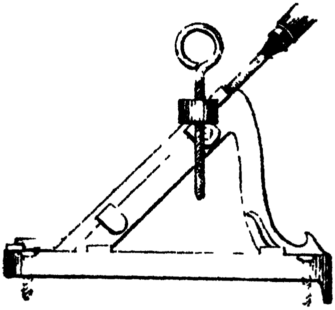


Fig. 137. Griffin's Registered Mitre Machine as used for Mitre Cutting. Side Elevation.

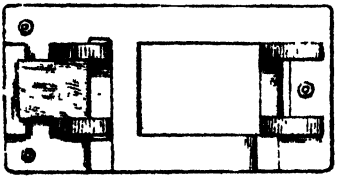


Fig. 138. Griffin's Registered Mitre Machine: Base shown in Plan.

Griffin's Registered Mitre Machine.

the guides as shown, and held firmly in the left hand. The wood being in the proper position the chisel is forced through it, the weight of the body being thrown on the chisel by pressing the shorter against the end of the handle. In mitring picture frames and wood of any kind, as moulding for doors, etc, it is better to cut the wood roughly to the angle required, and then to pare the end thus cut into perfect shape with the chisel. Picture-frame making does not come within the scope of this volume, although allusion to many pieces of work in which mitring is involved will be made from time to time; but a hint or suggestion on any particular subject is often useful, and as mitring in joining up mouldings for doors and in cutting the ends of the parts of a picture frame is done in the same way in each case, no excuse is needed for mentioning the latter.

Nailing on mouldings.

242. The first step, then, in the improvement of plain panel doors is to relieve and tone down the stiff appearance of the abrupt break between the projecting surface of the framing and the recessed surface of the panels, by the intervention of moulding; and here a word or two of caution to the amateur wood worker is necessary with regard to the manner in which the mouldings are to be nailed to the door. In Fig. 139 is represented in section a part of the frame and a panel of a framed door which has been turned out by the joiner as a plain door in every respect, being utterly bare of mouldings on both sides of the panel. The door is a light door, having a frame of 1½ inches in thickness, and the panel itself is ½ inch thick. Therefore the thickness of the frame between the surface of the panel and its own surface is just ½ inch. The carpenter determines to improve the appearance of the door by adding mouldings to it; and the first thing he must do, or, in other words, ought to do, is to take the door off its hinges or unhang it, and place it on a couple of stools with the side uppermost to which the mouldings are to be attached. It is no easy matter—indeed, a task that is well nigh impossible—to nail the mouldings to a door that is hung and in an upright position; and therefore the home carpenter must be content to remove the door and get it into this position before he commences operations. We will suppose that the mouldings needed for the four panels have been cut, pared at the diagonal lines of junction, fitted and pressed tightly into place, and that nothing now remains to be done but to fix and secure them by nailing. The moulding to be used is a narrow moulding, and is about

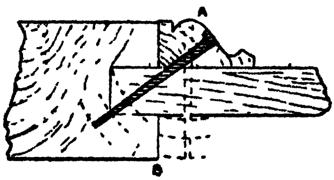


FIG. 139. Mode of nailing Moulding to Panel Door.

1 inch or 1⅛ inches by ⅜ inch to ½ inch. I have used the term "nailing," but I might as well have said "bradding," because brads are used and not nails, and because brads are finer and of less substance than nails, and have only a small projecting piece on one side at the top to serve as a head, and are therefore more readily and completely driven below the surface with the punch, and leave a smaller hole in the moulding, to be filled up with putty or any other kind of stopping. In buying brads ask always for oval brads, and see that you get them. They are far better made than the ordinary brad. As may be understood from the term by which they are known, they are devoid of rectangular edges, they have sharper and better defined points; and the head, which is also oval, although but very little larger than the brad itself, projects slightly all round the brad, and not on one side only.

213. Everything, then, is in readiness, and the amateur wood worker has provided himself with some inch or inch and a quarter brads for the work. Inch brads are the very shortest he should have, for three-quarter brads are too short and too fine. Now, what I want the home carpenter to remember and lay to heart is, that he must drive the brads through the moulding and into the frame in a *diagonal* direction; and if he will look at Fig. 139 he will soon understand why it is imperative on him to do so. For the sake of example I have shown an inch and a half brad as having been driven in, and that a brad of this length may be used without injury or disfigurement to moulding or door, because, owing to the direction that has been taken, the whole of the brad is buried and hidden from view; and even if it had been a 2-inch brad, supposing that brads of this length and sufficiently fine for the purpose could have been obtained and had been used, the points would not have come out on the other side of the framing. The natural impulse of the operator would have been to drive the brad through the moulding and the panel that lay immediately below it in an upright or vertical direction; and the result that he would have obtained had he done this with an inch and a half brad is graphically and convincingly shown by the appearance of a good half-inch of the business end of the brad on the under side of the panel. And more than this, the brad point would not have made a clean puncture in the wood, but being square in form—I am speaking now of the ordinary brad, and not of the oval brad—it would have broken up the fibre of the wood at the surface and have driven it out beyond the surface, causing a disfigurement that it would have been very difficult to set right again and remove all traces of it. Supposing an inch and a quarter brad had been used the result would have been the same, and had even an

Direction in which to drive in brads.

inch brad been used the point would have appeared on the other side when the head was punched in below the surface of the moulding. The dotted arcs have been struck from the head of each nail at distances of 1 inch, 1¼ inches, and 1½ inches, the diagram having been drawn half-size, or on a scale of ½ inch to 1 inch. The dotted line A B has been inserted to show that it is necessary to avoid giving a slight diagonal direction only to the brad; for this would, in all possibility, lead to the issue of the point of the brad just at and across the line along which the surfaces of the panel and the inner edge of the framing meet at right angles, a disfigurement which is without remedy, except by the withdrawal of brad and moulding — a difficult procedure if more than one brad has been driven in, and all that have been put in have been inserted, as it is very likely to have been the case, at different angles of inclination.

Rule for bradding on mouldings.

244. Remember, then, that in bradding on a moulding it is best first of all to make holes for their reception in the moulding itself at a proper angle of inclination with a fine bradawl, and that it is safer and affords a better chance of preserving the proper degree of inclination throughout to hold the bradawl in the left hand and pierce the moulding by tapping it lightly with a hammer held in the right hand. In driving in the brad never attempt to drive it home with a hammer, but when the head is about ¼ inch above the surface of the moulding drive it home and bury the head beneath the surface by means of a fine punch. Thirdly, use brads of sufficient length but not too long, because the longer a brad is the coarser and thicker it is, and therefore the less adapted for the purpose in view. Inch brads for mouldings for cupboard doors and 1⅛ inch or 1¼ inch brads for the doors of rooms will be found sufficiently long for all practical purposes. Lastly, bear in mind that even if a brad longer than the length just named be used no harm can ensue, provided always that the brad has been driven into the moulding at a sufficiently oblique angle to the surface of the panel.

Treatment of bead butt and bead flush doors.

245. I have already said that I do not admire the external appearance of bead butt and bead flush doors. Excellent they are as far as strength is concerned; but through their plainness and want of relief on the surface they are by no means attractive to the eye, something like the horse which was described by his owner as being "a rum 'un to look at, but a good 'un to go". There are ways and means, however, of improving the appearance even of these, and of getting rid of that flatness and dull uniformity of surface that renders them to a certain extent objectionable. I once had frequently before my eyes two doors of this kind that were ever visible from the garden. One of these, which was the means of access from the

Mode adopted for relieving surface.

back kitchen or scullery to the garden, was a bead flush door, and the other leading from the entrance-hall into the garden was a bead butt door. Ultimately there was a third door close to the garden door, about three feet of brickwork or thereabouts intervening, which was rendered necessary by a slight extension of the house at a subsequent period. These three doors, two of which were glazed in the upper panels, I determined to try to improve. The means I took were simple enough, but far from being ineffective. I will endeavour to describe them with as little assistance as possible in the way of diagram, and that confined to just a corner of the glazed panel above the middle rail and the bead and butt panel below as shown in Fig. 140 In this single diagram I have sought to show both the old order of things as they were, and the new order of things after the alterations, or rather the additions, were made. Above, as I have said, there were two glazed panels, and, as far as I remember, the edge of the frame was just broken, if it was broken at all, by a very narrow bead; indeed, if there was any bead at all it was only a bead $\frac{1}{8}$ inch or $\frac{1}{16}$ inch in width, and we will take it that this was so. This, then, is just perceptible round the corner of the glazed panel shown at A. At B below is a corner of the bead butt lower left-hand panel of the door, and the bead that surrounded the edge of the panel is just visible for a very short distance below the representation of the addition by which it is subsequently overlaid and hidden. The vertical line between A and B shows the junction of the middle rail and style, which in this case was the falling style. The narrow bead round the glass fell just within this line, which found its continuation in the edge of the framing of the door, which tends to show that this beading was in reality the edge of a thin slip nailed on to the inner edge of the framing of the door, probably because the rebate within for the reception of the glass was not deep enough. The bead surrounding the lower panel fell, as a matter of course, within the inner edge of the framing, which would be shown by the prolongation of the line showing the inner edge of the frame in a downward direction.

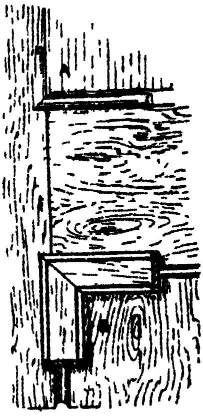


Fig. 140 Improvement of Bead Butt Door.

Description of mouldings used.

246. So much, then, for things as they were; I will now describe what I did to cloke them over. As it was impossible to put a raised framing round the glazed panels, owing to the extent to which it would have encroached on the styles, and especially on the muntin that sepa-

rated the glazed panels, and which it would have nearly covered, I determined on surrounding these with a small semi-circular moulding, of the description technically known as "mopstick" moulding. This is readily obtained at any time by obtaining a few circular rods from any carpenter or manufacturer who makes racks for plates and dishes, and dividing them lengthwise with a fine tenon saw. A rounded moulding is thus produced which is not semicircular in shape, strictly speaking, owing to the slight loss of material through the abrading action of the saw, and the necessity, perhaps, of removing with the plane or chisel any slight inequalities of surface which have been produced by slight divergence of the saw at one side or the other in sawing from end to end of the rod. When I had sawn up enough to go right round the panels, I mitred the angles, and bradded on the moulding, bringing its inner edge in immediate contiguity with the outer edge of the narrow beading that I have already mentioned. So far I was satisfied with the result obtained with regard to the upper panels of the door, and I then proceeded with the work of masking the beading below.

Small mop stick moulding round glass.

247. First of all I saw that it was necessary for appearance sake that the outer edges of the mopstick moulding above and the moulding covering the bead below should be in one and the same straight line; so I applied a straight-edge—that is to say, the edge of a long piece of wood that had been truly shot, and was kept entirely for purposes of this kind to the outer edge of the mopstick moulding, and then with a pencil I drew a line on the style outside the bead, showing exactly the position of the outer edge of the new moulding by which it was to be covered in. I took the distance that intervened between this line and the edge of the style with a pair of compasses, and having marked equal distances on all the remaining sides of the two panels, I drew, with the aid of pencil and straight edge, straight lines round each panel, which defined the position of the pieces of moulding about to be put on. This moulding, however, had to be made; and its character will be seen at once from the corner shown at B in Fig. 140. I did not wish to overload the door with anything that might prove to be too heavy in appearance; so I cut out some strips of wood, rather more than 1¼ inches wide and just above ¼ inch thick, so that they would plane down to these dimensions; and then I ran a narrow bead along both edges of each strip, of the width of the narrow bead already described as being within the mopstick moulding round the glass. Thus I endeavoured to preserve uniformity of dimensions as far as I could, and in everything in which it was possible to do so; and this the reader will think, perhaps, was not to any very

Beaded moulding round lower panels.

great extent. Still, half a loaf is always better than no bread at all; and so uniformity of treatment as far as it can be achieved is always better than an utter departure from it. When a sufficient quantity of these strips had been prepared and beaded, I cut them to the proper lengths, and mitred them as in the case of the mopstick mouldings, and then bradded them on. The doors had been painted stone colour, and the fresh white wood mouldings on the old sun-blistered paint had anything but a good effect, as may be imagined; but as it was necessary to paint all the wood work at the back of the house, this did not trouble me; and when the three doors were painted in resemblance of wainscot oak and duly grained and varnished, the effect produced was in every way satisfactory. The grainer was somewhat troubled because the edge of the style that showed the top, middle, and bottom rails was further in than it ought to be; but this was a thing that could not be helped, and so it was no use for him or me to exercise our minds about it. It was an eyesore, it is true, but not much of a one.

248. It does not follow that any amateur wood worker who determines on treating a door as I treated mine must of necessity copy my mode of treatment. I am only seeking to show general principles, and in no way to insist on any speciality of detail. If a flat strip had been put round the glazed panels instead of the mopstick mouldings, as shown at A in Fig. 140, and the surface reeded, that is to say, worked with a reeding tool or bead router, so as to present a succession of beads or reeds in parallel lines over the entire surface, and the edges of the strips below had been reeded to correspond, leaving a narrow plain strip between the reeding on each side, it would have looked quite as well and perhaps better. In all these points every one must follow his own particular fancy. I must not omit to say that in the bead flush door that led from the back kitchen into the garden, I covered the beads of the panels above and below with strips worked on the pattern described above; but I was able to place these with the outer edges coincident with the outer edges of the panels, beading included; and so the width of the styles and muntins was preserved from top to bottom without the least encroachment, as in the case of the other two doors. It would have been possible to have broken up the surface of the panels with Japanese work in narrow strips bradded on; but I will say nothing now about this, as mention will be made of its application in various ways later on.

Variations in style of treatment.

249. Let us now turn our attention to ledged doors, about which I have much to say, and especially with regard to their ornamentation: but on this point, on which a volume of no mean size could be written, I must be neces-

Definition of remarks on ledge doors.

sarily brief; and after describing the general principles of procedure, I must leave my readers to work out details for themselves, determining them according to circumstances and position. I must content myself, therefore, with mentioning, firstly, the construction of the ordinary ledge door; then an improved method of construction suitable for the amateur wood worker; thirdly, the means that may be adopted for the ornamentation of ledge doors; and, lastly, some account of a door, or rather, two doors that I made for my cellars, and which were much admired by all who saw them. It is true that I am dealing with doors for the house; but what is effective in one case is equally effective in another, and the mode or modes of treatment to be described will apply to all the doors that an amateur wood worker may make; for I do not think he will ever take the trouble to make a framed or panel door when he finds how easy a ledge door may be made, and how it is as easy to make it present an appearance satisfactory to the eye as it is to put it together on the ugly and repulsive lines which are usually adopted.

Construction of ledge door explained.

250. A ledge door may be defined as consisting of a series of boards placed vertically, and generally consisting of match-boarding, because this kind of stuff is grooved and tongued, and the line of junction between the boards from top to bottom is broken by a bead. These boards are nailed on to two or three ledges placed horizontally, two being sufficient in the case of a light door, while for strength's sake three must be used in a heavy door. The construction is clearly apparent from Fig. 141, in which *a*, *b*, *c*, *d*, are the vertical match-boards, which should be ⅝ inch or ¾ inch in thickness, nailed on the ledges *e* and *g*, which should be from ¾ inch to 1 inch thick, according to circumstances The diagonal piece *f* is used as a brace to strengthen the door, and to afford additional support to the match-boarding, which is firmly nailed to it as to the ledges *e* and *g*. The elevation of the back of the door is shown at A with the hinges, known as cross garnets or T hinges, by which it is hung to the frame, and the latch by which it is fastened when closed. The diagonal piece or brace *f* is usually let into the ledges *e* and *g* at each end in the manner shown. One object of the diagonal brace is to keep the door from "sagging,"

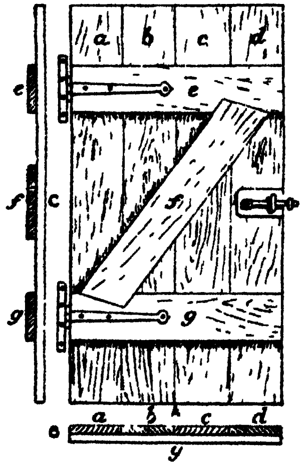


FIG. 141. Construction of Ledge Door. A. Elevation of Back, B. Horizontal Section along Ledge. C. Vertical Section through Central Line

as it is termed, or falling forward, which all heavy doors are inclined to do, the strain being greatest on the upper hinge. The door is a strong and useful form of door, but the construction is ugly. This, however, is of no matter in cellars below the ground level, and in all places in which the back of the door is seldom or ever seen; but when the ledge door is used for kitchens and offices attached to the house, as it sometimes is, especially in farm-houses, a different mode of construction should be adopted.

Alternative mode of constructing ledge doors.

251. It is possible to hit on more than one method of effecting this, but one alternative mode must suffice here, which will be suggestive of others. This is shown in Fig. 142, in which the lines of junction caused by the use of match-boarding have disappeared altogether, and a series of triangular panels has taken their place. The framing represented in the diagram is made first, that is to say, the two styles and the three rails are halved together and strongly fastened up with screws inserted from the inner part of the frame. The styles, perhaps, would look better if the halving was reversed, and the styles were shown as overlapping the ends of the rails, instead of the ends of the rails overlapping the styles; as in the diagram. In a door made on this principle the appearance would be much lighter and prettier, because it would be sufficient to make both styles and rails about 3 inches wide for small light doors, and not more than 4½ inches for heavy doors. The place and purpose of the single diagonal brace shown in Fig. 141 would be taken and carried out by the arrangement of four pieces of wood, of the same width as the styles and rails in the form of a saltire, or St. Andrew's Cross, as shown in the illustration. These pieces are halved together, and are cut full and driven into place after the boarding that forms the front of the door has been screwed on to the styles and rails. The object of this is to keep the inner surface of all parts of the framing perfectly flush and on the same level, so as to afford the best possible lodgment for the boards in front. Match-boarding may be used; but supposing the door shown above was required to be 2 feet 9 inches in width, I should prefer three boards 11 inches wide jointed together with dowels. It may be urged in the way of objection that the boards would in all probability shrink, and that the shrinkage would cause chinks from top to bottom. *Respice finem*, or, in plain English, wait for the end; and it will appear presently that not a

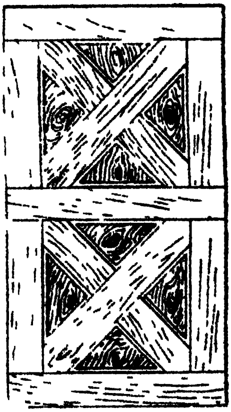


FIG. 142 Another Mode of Constructing Ledge Doors

joint in the front will ever be visible externally, and that internally they may be hidden from view by dropping thin panels, properly jointed and glued up, into each of the triangular panels, and holding them in place by stops with nicely rounded edges nailed or bradded to the edges of the styles, rails, and cross-pieces as shown, although roughly and disproportionally, in Fig. 142.

252. Do my readers know what "mocking" means? Some of them may, but I am inclined to think that a very large majority of them do not at all events, not in the sense in which *I* mean, for I am asking the question not mockingly but seriously. The term "mocking" conveys the idea of imitation, generally imitation with ridicule, but sometimes in the sense of imitation pure and simple, without any ridicule at all the imitation, in fact, of reality. I have never come across it in any dictionary, however complete and comprehensive, as applied to the overlaying of plain work - joiner's work —in shipbuilding with strips and pieces of wood in imitation of panelling, etc., so as to give the observer the idea of panelling made in the usual way; whereas in reality the work is solid and substantial below, and in no way akin, save in its appearance as it meets the eye, to the lighter work of which it is an imitation. The use of the term in this sense I picked up from an old working joiner who had been employed at Northfleet Dockyard on the Thames a little above Gravesend, a dockyard from which many a good ship has been launched, and notably H.M.S. *Northfleet*, but which has long since gone to wreck and ruin owing to the introduction of iron-built ships. It was this old carpenter who put me in possession of the term, and told me in what sense it was used by him and his mates, and without doubt generally in shipbuilding, and ever since then I have used it and use it now; the kind of work I use very much myself in ordinary carpentry, and which I strongly recommend to the amateur wood worker and home carpenter, because it is easily done, presents an excellent appearance, and saves a great expenditure in labour and time, which means much more to the amateur than it does to the professional.

Mocking.

253. For the sake of example let us take a very simple case a panel such as may be used as a cupboard door done in mocking. If it be an 18-inch door made in either way six pieces of wood will be required, so the material used is the same, and the result obtained is the same as far as appearance goes; it is only the *modus operandi*, or the manner of working, that is different in each case. In making the panel door, two pieces of wood would have to be jointed together and glued up for the panel,

Panel in mocking.

and the rails would have to be mortised into the styles, and the inner edges of the styles and rails grooved for the reception of the panel. I said that as much material would be required in either case, and I do not think I am far wrong. It is true that only half as much or thereabouts would be wanted for the panel, as it would be much less in superficial extent, and perhaps a little thinner than the boards used for the panel in mocking: but then, again, the rails and styles are not, or need not be, more than one-third the thickness of the rails and styles used for the frame door, so perhaps, as far as material is concerned, it may be regarded as being six of one and half a-dozen of the other. Now, let us look at the panel in mocking as represented in Fig. 143, and let us suppose that the door is 24 inches by 18 inches, as it is very nearly in the diagram, which is approximately correct, but is not drawn exactly to scale. In this A is the front elevation, Y the section down central line in which the boards are jointed, and Z a horizontal section through one of the rails. Firstly, two pieces of board are taken, 9 inches in width and 2 feet in length, and are dowelled together, the edges being glued before being brought into contact. With regard to thickness, ⅝ inch or ¾ inch will be thick enough. The extent of the boards thus joined is indicated by the letters G, H, L, K. Next, a strip of wood about ⅜ inch thick, or rather more, so as to plane down to a thickness of ⅜ inch, is prepared, from which the rails and styles are to be cut. This should be from 3 to 3½ inches wide, and from it must be cut two styles, 2 feet in length, and two rails 18 inches in length. These may be halved together at the corner, or the rails may be cut shorter, and the ends rebated and put into pockets cut in the edges of the styles, as shown in Fig. 144, in which A shows plan and elevation of the rail, and B the plan as seen from below and side elevation of the style, G being the pocket, and D the tenon. In this the tenon D consists of a projection from the end of the rails about half its thickness and reduced in width, and G shows a corresponding recess cut in the style for its reception; C the end elevation of the short tenon, and H, which is similar in form, the end elevation of the pocket. At E a longitudinal section of tenon and pocket is shown, and at F a method which is some-

Construction contrasted with framing.

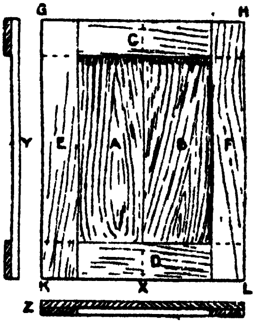


FIG. 143. Panel on Cupboard Door in Mocking.

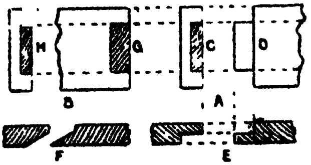


FIG. 144. Diagram showing Mode of connecting Style and Rail by Tenon and Pocket.

times adopted in making tenon and pocket, and which is sufficient to hold down the rail and prevent it from slipping out. When the rails and styles are ready, all that is necessary is to brad or screw them on to the boards on which they are superimposed in the proper position, and the work is finished. I have said nothing about the treatment of the inner arris of rail and style. Beading will be found troublesome, and the only ornamentation that can be adopted with safety is stop chamfering; but as this will be treated presently, I will say nothing about it here. I have put the two ways of doing the work clearly enough before amateur wood workers, and it is for such individually to decide whether they prefer to adopt legitimacy of operation, or to take refuge and save time and trouble in mockery.

Exterior treatment of ledged door by mocking.

254. But now let us turn to the completion, by mocking, of the ledge door, the back of which was shown in Fig. 142. We have determined, let us say, to form the semblance of an arcaded door in three panels. It will be remembered that the ledge door in this case was formed of three boards, each 11 inches wide, carefully jointed and dowelled together. These boards are defined by the dotted lines shown in the diagram, and which show the junction of the boards which for convenience sake I have lettered A, B and C. Let us further assume that the three panels are to be separated by two intervening strips of the same width as the external styles, and that all these pieces are of the same width, which we will assume to be 2½ inches. The styles we will letter D, E, F, G. The entire width of the door is 11 inches × 3, and is therefore 33 inches. The collective width of the styles or vertical strips is 2½ inches × 4, and is therefore 10 inches. If, then, we subtract the collective width of the styles from the entire width of the door, namely, 10 inches from 33 inches, there is a remainder of 23 inches, which when divided by 3, the number of panels, gives 7⅔ inches as the width of each individual panel. Taking ⅜ inches as the thickness of the stuff to be used for the styles, we shall have to get out from stuff about $\frac{7}{16}$-inch thick, four styles which will be, when planed down at the edges, 2½ inches wide and ⅜ inch thick. The length we have not yet determined; but supposing the door to be 6 feet in length, or better 6 feet 3 inches, because 6 feet is not high enough to admit of the passing in and out

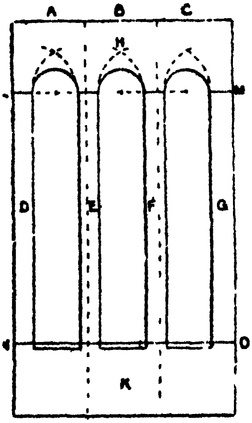


FIG. 145 Arcaded Exterior of Ledge Door as shown at back in Fig. 142

Determination of width of panels.

of men 6 feet in height with hats on, and that we have determined on making the board at the top and bottom of the door, as shown at H and K, 11 inches in width, this will give us 75 inches − 22 inches = 53 inches for the length of the styles; and we must cut them a little longer than this to admit of squaring up the ends, and making the necessary tenons to fit into pockets in the upper and lower boards; and thus, if we allow 4 inches for these purposes, the length of the styles will be 57 inches, or 5 feet less 3 inches. Having cut and prepared these, let us lay them on one side for the present.

255. It is desirable that the spaces to be occupied by the head-board H, the foot-board K, and of the styles D, E, F, G, should be carefully set out on the surface of the door itself, which should have been dressed at the joints with a plane and sand-papered down. The setting out will consist, first of all, in marking the lines L M, N O on the door at 11 inches from the top and bottom. Then in order to determine the spacing with the utmost accuracy, set out the spaces seven in number, namely 2½ + 7⅔ + 2½ + 7⅔ + 2½ + 7⅔ + 2½ in inches, on a strip of stiff paper, and apply this strip first to L M and then to N O, and mark the spacing carefully on the door. By this mode of procedure we obtain the utmost exactness above and below, and ensure complete correspondence in the marking on each line, which further ensures exact parallelism in the styles; and the most careful of us is apt to make a mistake in setting out from or by a two-foot rule, and a difference even of ⅛ inch would throw everything out, if it happened at starting. But this may be avoided by the adoption of the plan that I have suggested, and any possibility of error is removed. I have been told sometimes that I do my work "too nice," or otherwise that I make parts fit too closely; but I like accuracy of fit, if not nicety of finish, even in rough things, and I would far rather err on this side than on the other. Having determined the spacing by the means suggested, and marked all the points, take a straight-edge and mark out between L M and N O the straight vertical lines which determine the edges of the styles.

Setting out spaces on door.

256. Having prepared and planed up the head-board and foot-board and ascertained that they are true and square, mark on the lower edge of the head board and the upper edge of the foot-board spaces of precisely the same length. See how useful the strip of paper already prepared comes in here; for by its aid the spacing can be marked out very rapidly, and with an exactness and correspondence that is not to be gained by any other means. The length of the longer spaces, or, in other words, the width of the panels, is 7⅔ inches, or $7\frac{8}{12}$ inches. Therefore, additional marks must be made on

Treatment of head and foot boards.

the edge of the head-board showing the centre of these spaces, and it will save trouble if this were done on the paper beforehand. The intermediate spaces for the panels will thus be centred at $3\frac{10}{12}$ inches, and this will be the radius with which the semicircular heads of the panels as shown in Fig. 145 must be struck on the head-board. Strike them accordingly with a pair of compasses opened out to the radius mentioned, and from centres exactly intermediate between the markings which define the position of the styles. If a gothic or pointed arch be preferred, strike them as shown by the dotted lines with a radius equal to the width of the panel, namely $7\frac{8}{12}$ inches from the terminations of the lines denoting the width of the panels as centres. Cut these semicircles on pointed arches, as the case may be, very carefully with a fine saw, a fret-saw will be found to be better than a keyhole saw, and, then, having taken the foot-board, cut the space denoting the width of the panels, in a slanting direction as shown in Fig. 145, making the depth of the entire slope equal to the thickness of the board, or rather the depth of the space to be cut to make the slope equal to the thickness of the board, so that the slope itself may form an angle of 45° with the surface of the bottom board and the surface of the panel, or more strictly an angle of 135° with each surface; but my readers will understand my meaning even though I say an angle of 45°.

257. This done, in order to give lightness of appearance to the door thus treated, a bead should be run round the head of the arch, and down the edges of the styles, or, what is better, the arrises or edges should be slightly chamfered to the extent of $\frac{1}{8}$ inch, or $\frac{3}{16}$ inch all round, head and styles. This should be done with a chamfer shave, which has already been mentioned and described, and illustrated as well. I may, however, say that Stanley's Improved Chamfered Shave, which can be bought for 2s., is a better tool; it only costs 4d. more than the other, and is the more serviceable and accurate of the two, because it can be adjusted by means of thumb-screws attached to the guides, and will chamfer any desired width up to $1\frac{1}{2}$ inches. It is, moreover, round faced, and is therefore suitable for circular work. The next step will be to cut tenons at the ends of the styles and recesses in the head and foot boards; and here the workman may as well adopt the style shown at F in Fig. 147, for as the styles are long and thin, one end may be sprung without much difficulty into the recess cut for it after the insertion of the other end in the opposite

Beading or chamfering mocking.

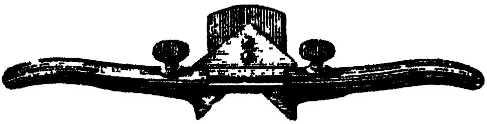


FIG. 146. Stanley's Improved Chamfer Shave.

Tenons in styles and recesses in head and foot boards.

recess. As a matter of course, it must first be ascertained that tenons and recesses have been truly and accurately cut. Half the width of the style, that is to say 1¼ inches, will be sufficient for tenons and recesses. Both head-board and foot-board should be screwed or nailed down exactly in place before the styles are inserted, and the same must be done with the styles as soon as they are in place. I omitted to say that an inclination is given to the foot-board at the bottom of each panel to prevent any lodgment of water, and to carry off any rain that may fall on it, should it be one of the doors of the house, or without the house. The width of the styles should in all cases be so regulated as to ensure the covering and hiding of the jointing of the boards below, as any appearance of them would detract from the look of the panelling. Nothing now remains but to attach the necessary hinges and fastenings; and when the hanging of the door has been effected I do not think that any reader who makes one will be dissatisfied at its appearance.

258. I now come to the doors which I made and put up in my cellarage, to which I have so often alluded, in the doorways that gave access to the coal cellar, and the space under the dining-room. And with a description of one of these I will bring my chapter on the improvement and making of doors to an end. The general principles will have been described, and examples given, and the reader must then be left to apply these to doors which he may be led to make to suit his own requirements. There is no necessity to adhere strictly to dimensions, as these have been already indicated in the description of the cellarage and all that was done in it. Moreover, it is only a sketch and description that is required, as the method of doing the work has already been given in detail. When looked at from behind, the doors, which were ledge doors, were made in the usual way, because this part was out of sight, but in front they consisted of three pieces of stout boarding, whose binding it was necessary to mark, as in the case of the door in Fig. 145. Moreover, it was necessary in order to carry the fittings, that is to say the heavy iron latches with which they were furnished, to have a middle or lock rail, as well as a top and bottom rail: so I determined on making a six-panel door in mocking, which, when completed, had an excellent effect. That this was so may be seen from Fig. 147. The panels were narrow, but those with rails and styles were well proportioned, and the narrow width tended to lend height to the door, which was otherwise wide in proportion to its length, and would have looked somewhat squat, had it been mocked to imitate a four-panel door, which would have had the effect of exhibiting the joints of the boards. When the doors had been made, the styles, namely the

Ledge doors in cellars.

hanging style and the falling style, were put on, extending in the usual way from top to bottom; but before this was done the stop chamfering was cut in each, as, indeed, it was in every piece of mocking before it was put on. Half-inch stuff, or stuff that is known as half inch, was planed over and used as mocking, so that an appearance of great strength and solidity was gained, which was thoroughly in keeping with the massive swing handle, pendent from a heavy cruciform ornament that was used to actuate the latch that served to fasten the door within. When the styles had been screwed down in place, the rails, which had been cut full, were pressed in between them without any tenoning, and the tenoning was omitted because a cellar below ground is always or most generally damp to a certain extent, and there is no reason to anticipate shrinkage to the extent there might be supposing the door were above ground and exposed to the influences of sun and rain. After the rails had been put in place and properly fixed the muntins were inserted in the same manner, and this done and the latch put on, each door looked as strong, pretty nearly, as a church door, and as solid as a rock. Every one who saw them admired them, and especially professional carpenters, who at first sight thought the doors were framed in the ordinary way, and wondered why I should put doors that appeared so costly—and would have been costly had they been made in the ordinary way—in such an out-of-the-way position. Had I thought I should eventually leave the house, I should have left the place untouched; but I did there as I have done but too often in other places—improve the building for the good of others rather than myself. Nevertheless, my labour and thought and trouble were not entirely thrown away, for I sold the house at the rate of an increase of 10 per cent. on the money I had given for it, and although the increase in value—and the value of property was declining in the neighbourhood—did not in any way compensate me for what I had spent on the house first and last, still it was reclamation of money spent to a certain extent; and with this I had to be satisfied.

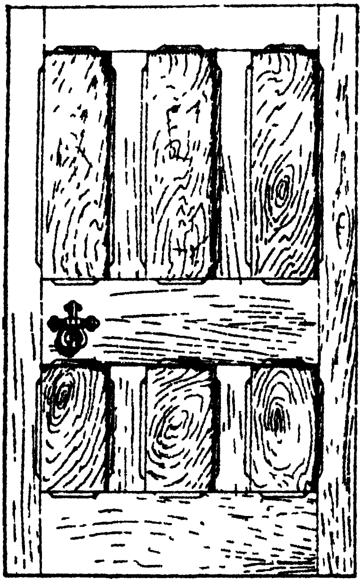


FIG. 147. Front Elevation of Ledge Door showing Six Panels with Rails and Styles Stop Chamfered

And the moral of the whole is this—that improvements in houses may be regarded on the whole as leading up to an improvement in value and price to be obtained on selling again; for had I not done what I did, I must have sold at a loss on the price given; at which, in all probability, I should have grumbled and growled.

Chamfering and stop chamfering.

259. I am afraid I have not been explicit enough nor helpful enough in the matter of chamfering and stop chamfering. That I have mentioned it before, I am aware; but I do not think I have dwelt sufficiently upon it to have been really and truly of service to my readers. Let me endeavour to make up for my shortcomings here. Chamfering may be defined as the removal of the sharp arris or edge formed by the meeting of two plane surfaces so as to prevent a flat surface. It is applied to the removal of the edge in any material, whether wood, stone, or brick. Stop chamfering is the stoppage or cessation of carrying on the chamfer to the end of the piece of wood or other material on which the chamfer is cut. In chamfering in joinery, it is desirable that the straight lines which indicate the limit of the chamfer should be equidistant from the edge on either side. In Fig. 148 will be found an example necessary to show how to mark the edge of wood for chamfering. Supposing it is considered desirable to remove the edge to the depth of $\frac{1}{8}$ inch on either side, the marking gauge must be set to the extent of $\frac{1}{8}$ inch between the head and the marking point; and the gauge must be drawn flush along the edge, and then along the side of the wood until the lines are clearly defined. This must be done in case the edge, in absence of other tools, is removed with a chisel—a difficult and delicate operation. The marking in this manner is shown in Fig. 148. Stop-chamfering is shown in Fig. 149, in which the commencement of the marking of the lines on either side is shown, and the chamfer itself stopped or stayed before it reaches the end of the wood by an incision with the chisel made in a slanting direction from the edge to the surface of the chamfer. It is desirable that the form of the incision should assume that of an equilateral triangle in which the sides are all equal; and in such a case, the length of the sides of the

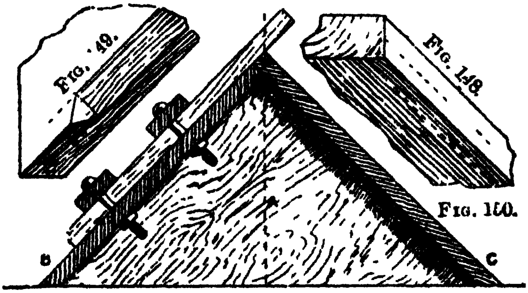


FIG. 148 Mode of Marking Wood for Stop-Chamfering. FIG. 149 Example of Stop-Chamfering FIG. 150. Contrivance for holding Wood when Chamfering.

incision would be equal to the breadth of the chamfer. In cutting a chamfer with the stop-chamfer plane or the chamfer shave, the marking of the lines on the surfaces of the wood is not a matter of so much importance; for as these tools are set to a gauge, and work on guides or fences, set so as to form the sides of a right angle, regularity of form and equidistance from the arris on either side must be preserved. Further, the edge of the cutter forms the base of an isosceles triangle, the sides of which are equal.

Contrivance for holding board in chamfering edge

260. I know that there is difficulty in putting and keeping any board whose edge it is necessary to chamfer in a convenient position for chamfering. The difficulty lies first in putting the board in such a position that the tool employed, whether plane or stop-chamfer shave, may be kept in a horizontal position; and, secondly, unless this is done by special means, there is a difficulty in maintaining the board in such a position as I have indicated. I have therefore thought out a contrivance for this purpose, which any amateur wood worker may make for himself without any very great trouble or labour. In the first place, two substantial blocks must be cut from a piece of wood, say 2 inches in thickness, which take the form shown at A, in which the angle at the apex is a right angle, and the angles at the base are angles of 45°. These blocks must be of exactly the same size, similar in every respect as regards the angles and the length of sides and base. These blocks are placed in a parallel position at some distance apart, say from 2 to 3 feet, and they are connected by two boards, B and C, placed on them in the manner shown, and firmly screwed down to the edges of the blocks. As these boards are of the same thickness, so that the faces of the slopes presented by them are parallel to the edges of the blocks, one of which is shown at A, the angle at which their surfaces meet at the apex is still a right angle, and the angles at the base are angles of 45°. Now, if any board or piece of wood whose edge requires chamfering is laid on either side of this triangular support, it is in the position required; for the edge to be chamfered is presented in such a position that either plane or shave may be worked along it, so that the surface of the chamfer is perfectly horizontal. To hold the board in position, two clamps are employed in the form of two long strips of wood through whose ends bolts are passed, and these bolts pass also through holes bored for their reception at the extremities of the boards B and C, and are held firmly together and on the wood by nuts screwed up from below on the ends of the bolts until a sufficient grip is obtained. Of course, the length of any board chamfered in a contrivance of this kind must be regulated by the length of the contrivance itself.

Alternative clamp for holding stop chamfered work.

261. There is an alternative method for making a clamp for holding stop-chamfered and chamfered work while the chamfer is being cut, which may as well be described, as it is as good, if not better, than the one described above; and many home carpenters may prefer it, because it is better suited for long pieces of work, and allows of their being shifted from time to time as the work of cutting the chamfer proceeds. It also gives me an opportunity of putting before the reader an elevational view of the clamp which I did not give in the case of the clamp that is shown in Fig. 150, because I considered that an end view as given would be sufficient for all practical purposes. Now, in the alternative form of clamp to be used in holding slips of wood when being chamfered, the cradle or saddle, as I may call it, in or on which it is laid need not be so long as the other, and the clamping pieces themselves are in a vertical instead of a horizontal position. In the diagram A B C D, is one side of the saddle, the upper part of it, which would be concealed from view by the slip E, which is marked for chamfering at the upper edge, being indicated by dotted lines. The slip E is held tightly in position by the clamps G, H, two stout and strong pieces of hard wood, through which and the saddle bolts are passed from below, and pressure exerted on the slip E by screwing the nuts on to the bolts until they can go no further. A slip of wood, F, corresponding in thickness to the slip being chamfered or stop-chamfered, as the case may be, is passed under the other and lower end of the clamping pieces, the object being to keep the lower surface of the clamping blocks parallel to the surface of the saddle, and to provide for equality of pressure over the whole area of contact between the clamps and the slip E. For, were this not done, the lower edge of the clamping blocks G and H would rest on the surface of the saddle, and the blocks themselves would be at a very acute angle with it. Thus the contact of G and H with E would be limited to a single line as long as the clamp is wide, and the consequence would be that when the nuts are screwed up pressure would be exerted on the lower edge of the slip in these parts, and the edge, in all probability, would be crushed and spoilt. And thus in exercising pressure with the bench vice care must be taken that the inner surface of the cheek of the bench vice and the outer surface of the front board of the bench are parallel and equidistant throughout the entire area of the former.

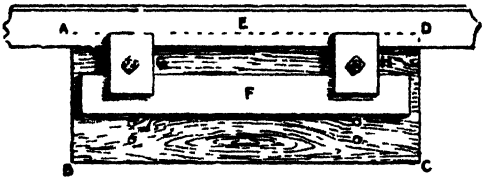


Fig. 151 Alternative Form of Clamp in Chamfering

262. And here, according to promise, I must end my chapter on doors, contenting myself by saying that I have made many, and have generally introduced some novelty of treatment into each. Stereotyped forms are objectionable, at least to me; and in everything I have and everything I do, I like to have something different to the general run and order of things. And I would advise my friends and readers to adopt the same plan, if it meets their views. I could say much more on this and every other subject that is treated in this volume: but writers are bound to space; and publishers, as a rule, do not care to have the limits agreed on exceeded, because additional pages lead to additional cost of production, which, on the other hand, necessitates the adoption of treatment which deteriorates from the appearance of a book. I have, however, said enough to show every reader what may be done in the matter of such prosaic things as square-headed doors, and I cannot now go into other forms, whatever I may do hereafter. I have no doubt, however, that the ingenuity of many a reader will lead him to devise forms and patterns which will beat those I have brought before him "into fits".

Advice to home carpenters on treatment of doors.

CHAPTER VIII.

ABOUT CORNICES, DADOES, CHAIR RAILS, AND SKIRTING BOARDS.

Cornices--Character of Cornices—Colouring Existing Cornices—Gilt Strips under Cornice—Influence of Cornices on Rooms—Typical Form of Cornice--Cornice Mouldings: where to get them—Good Moulding for Cornice of Small Room and Furniture—Fixing Moulding round Ceiling of Room—Preparation of Triangles for fixing—Fixing Triangles and Slips to Wall—Fixing the Cornice Moulding—Armorial Bearings as Ornamentation for Cornices—Symmetrical built-up Cornice—Imitation *versus* Copying--Construction of Mouldings—Lesser Members of Cornice—About Chair Rails, their Use and General Principles -Form of Chair Rail in Modern Ornamentation—General Relations of Chair Rail and Skirting—Chair Rail—The Skirting—Relative Proportions of Chair Rail and Skirting—Treatment of loose Plastering—Patterns of Chair Rails and Skirting Boards—Pateras on Chair Rails—Enrichment of Skirting Boards—Gilt Slips about Chair Rails, etc.--Treatment of Door- The Genuine Dado, its Form and Purpose—Plain Panelled Dadoes- Skirting Boards--Panelling and Chair Rail—Construction of Panelling—Height of Chair and Dado - Working Drawing—Dimensions of the Dado—Panel and its different parts—Height of Panel—Width of Panel—Parts required for Panel, as per Diagram, with sizes—Foundation for Specimen Panel--Lining out Foundation to receive Parts of Dado—Repairing and fixing part of Specimen Panel to Foundation—Cutting Notches in framing and fixing it—Fixing Skirting Board in place--Fixing Chair Rail in place -How to hide Heads of Screws or Nails--Sand Paperer Treatment of Panelling round Rooms Width of Panels—Spacing out Walls for Panels - Treatment of Framing at Angles of Room—Setting out Rail for dividing Wall Space into Panels, etc. -Determining Width of Panels—Touching Minuteness of Detail Bold Chair Rail when admissible -Lining out the Wall itself—Testing Level of Skirting Board—Determining vertical Lines--Ornamentation of Panelling--Other Forms of Panelling for Dadoes—Rectangular Forms of Framing—Panelling in Form of Triangle—Ornamental Additions and Insertions—Panelling in Squares and Semi-Squares- Hexagonal Panelling—Octagonal Forms of Panelling—Curvilinear Forms of Framing arcaded Panels—Norman and Gothic Heading -Panelling in form of Guilloche Ornament—Serpentine Form of Framing—Use of heraldic Insignia in Ornamentation -Elliptic Framing—Panelled Dado on Staircase—Arrangement o vertical Pieces—Remarks on the Finish of the Walls of Rooms, etc.

263. Let us now glance briefly at points and places about a house in which improvements may be effected, at no very great amount of trouble, at no very great inroads on one's spare time, and at no very great outlay in the way of materials. I mean in the addition of cornices in rooms where there are no cornices, in contriving and putting up dadoes and chair rails, and in fixing skirting boards where there have been none before, or in rendering those that are already in existence handsomer to look at, and all the more massive by means of augmentations and additions. Let us begin by forming a definite idea

of the positions in which these architectural embellishments are used, and the objects to be gained in resorting to their use. And first, with regard to cornices, which may be defined as moulded projections of an ornamental character, crowning and finishing the part whatever it may be to which it is attached. From our point of view, the cornice is an ornamental moulding which runs along the top of the walls of a room immediately below the ceiling, which lies in the angle round the room formed by the meeting of the vertical planes of the four walls with the horizontal plane of the ceiling, and which forms an agreeable break satisfactory in every respect to the eye, to the monotony and bareness which is inseparable from the meeting of vertical and horizontal planes without intervention of any kind between the one and the other.

Cornices.

264. The cornice assumes widely different forms. It may be small, perhaps insignificant in size in some cases where the rooms themselves are small, and the walls of no great height; or in rooms that are high and lofty, it may spring from a moulded frieze running round the room, and, concealing from view the objectionable angle already alluded to, by means perhaps of a deeply coved moulding, be merged in a deep band which proceeds from its upper extremity and extends to some distance inward, over the surface of the ceiling. The principal rooms to villa residences and so-called cottages, much less the reception rooms in houses of greater pretensions, are never left now-a-days without cornices: but in old houses it is frequently the case that no finish of this kind is to be found; and it is to aid those who may be living in houses of this description, or who may wish to finish with cornices rooms on the first and upper floors of houses that have been left without them, that this chapter is written. I shall deal only with cornices of such a character and nature that the amateur wood worker will find no difficulty in putting up and fixing himself, and the manner in which they are to be fixed. I shall touch briefly on the ornamentation that may be attached to them, showing these things by the assistance of diagrams, and in every case extend my remarks no further than may be necessary for the guidance of the home carpenter in general principles.

Character of cornices.

265. Nothing, perhaps, except the utter absence of a cornice, is more objectionable than a cornice without colour, carrying the colourless white of an unbroken expanse of ceiling down the wall to which it is supposed to belong, and of which, as I have already said, it forms the crowning member. Into every cornice the prevailing colours of the paperhangings, or the tint

of the walls, should be carried, the projecting portions being coloured and the retiring parts left white, or lightly touched with a faint neutral tint; and even into the band which edges the ceiling, these tints should be carried, exhibiting any pattern that may appear on the band either in white on a pale tint or as tinted embossed work on a white ground. And these colours, if there be any central ornament from the middle of which a lamp, gasalier, or chandelier is suspended, should be carried into such ornament. I do not care for a ceiling absolutely white myself. I am perfectly aware that the object and utility of a whitened ceiling is the reflection of light; but of this but little is lost by the substitution of a faint tint in harmony with the paper and painted work in the room; and the glare is avoided, which is so fatiguing to all eyes, especially tired eyes that rest awhile on whitened surfaces. There are no white surfaces in nature save that of newly fallen snow; and even this, in our temperate zone, is not permitted to tire the eye for long.

Colouring existing cornices.

Gilt strips under cornice.

266. Between paperhangings or the tint with which the walls are coloured, a strip of gold should always intervene, in the form of a narrow band. This should be invariably the rule, and by no means the exception. For this purpose the thin and narrow mouldings, known in picture-frame making as slips, and which are usually placed under the glass in water-colour paintings, or as an addition to the principal moulding of the frame itself in the case of oil paintings, the object being in each case to give width to a gilt frame, and relief to a wooden frame, are admirably adapted for this purpose; and as they are very inexpensive, and are supplied in different widths, mostly in dead or mat gold, sometimes relieved by a narrow line of burnished gold, the amateur wood worker will find no difficulty in selecting something that will meet his views and requirements. They can be bought in any quantity of any picture-frame maker, and they are affixed to the wall by means of needle points, which are obtainable, or ought to be, from any ironmonger. These needle points cannot be hammered in, the home carpenter must bear in mind, to their entire length like a nail; they must be broken off short first of all, and then put through the slips with taps from a light hammer. If they enter the plaster or wood work to which the slips are sought to be attached to the depth of ⅜ inch, or at the utmost ½ inch, that is sufficient.

267. A white cornice always tends to dwarf a room, because the whiteness of the ceiling is carried onwards, *down* the wall, and the wall appears to be only of the height of the paper. On the contrary, a coloured cornice

tends to raise the height of the room, because the colour or colours that are prominent in the paper are carried *upwards* towards and even into the ceiling, and the cornice assumes its proper position as a part of the wall, instead of a pendant to the ceiling. There are cases in which rooms are of so low a pitch—I have known them to be no more than 7 feet in height, in some instances, in old houses—that the addition of a cornice, even if it were coloured, would only make the wall look less in height than it was before, especially if the rooms were of any size. In such cases all that can be done is to run the gilt strip round the top of the wall immediately under the ceiling, and to trace on the ceiling, not far from the edge, a band of the prevailing colour of the paper, relieved by a gilt line of half or perhaps less than this, of the width of the strip of colour, leaving an intervening line of white between the colour and the gold. By such simple means as these, the amateur may greatly improve the appearance of the principal rooms of his residence, and if he chooses to carry this kind of decoration into the bedrooms, he will not, to my mind, be doing anything that is out of the way.

Influence of cornices on rooms.

Typical form of cornice.

268. But supposing that there is a room without a cornice to which a cornice would be a judicious addition, let us see how the attachment of the cornice may be effected without any particular amount of trouble and without injury to the walls. A cornice made in plaster will generally assume something of the form shown in Fig. 152, which represents the section of a cornice in plaster; and here I may say that cornices are usually cast in plaster in short lengths, and then fixed by the agency of plaster of Paris in the angle formed by the junction of wall and ceiling, the former of which is represented by the line A B, and the latter by the line A C. The external moulding is necessarily the only part that meets the eye, and this is the part which should be tinted, and it might be tinted in the manner represented by the letters W for white, T for tint, and G for gilt slip, or *vice versa*, as might be found expedient. Now, the dotted line D E shows an inner right-angled triangle, and an outer facing wrought into hollows and projections; and it is manifest that if we could get such a wrought and moulded form in wood as appears without the dotted line D E, and attach it to brackets of the shape of the triangle A D E, fixed to the wall, there would be no very great difficulty in fitting any room with a cornice.

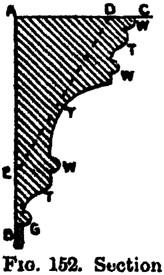


Fig. 152. Section of Cornice.

269. But some amateur wood worker may say, "Oh, yes, it is all very well to talk about getting mouldings ready to hand and attaching them to

triangular blocks, but where in the world is one to get the mouldings? I am sure I could not make so complex a moulding, even if I tried. I couldn't make a foot run of it, and as for making enough to go all round a room it would be beyond possibility to me at all events." To this I will reply that the making of a moulding on a flat piece of board with members of different forms is not altogether a thing impossible, as I will try to show presently; and as for getting mouldings ready to hand at a low rate, the home carpenter has only to write to Mr. Samuel Elliott, *Albert Moulding Mills and Joinery Works, Newbury*, for his price list; and when he gets it, his eyes will be opened to a considerable extent, and he will find that the making of cornices, beautifully moulded, is not only a matter of no difficulty whatever, but that a cornice of a room may be put up so rapidly that in all probability he will be dead set on to making cornices in every room throughout the house in which, at the time of the reception of the price list, there may be no cornices. And, further, he will find in the multiplicity of mouldings that will meet his eye, that it is possible to put up a cornice, and a very handsome cornice too, without the intervention even of the triangular block, which is absolutely needful for the attachment of a moulding such as is shown in Fig. 152.

Cornice mouldings: where to get them.

270. Now in Fig. 153, I have given, just half size, a sketch of a very favourite form of cornice moulding with me, taken from a sheet of cheap mouldings, issued by Mr. Elliott in his sheet No. 8, which is good in form, beautifully proportioned, and looks very well when put up. I have used it as a cornice to bookshelves, and for other articles of furniture, and in places where cornices are necessary; and I can therefore testify to its utility and excellence in every respect as well as its cheapness, being supplied at 9s. per 100 foot run. This cornice is ⅝-inch thick in its widest part, and is presumably wrought from wood ¾ inch thick. This and all other mouldings supplied by Mr. Elliott are wrought by steam machinery, and are remarkable for excellence of finish. It will be noticed that the surfaces A B, C D, forming respectively the top and back of the moulding, are at right angles to each other, and consequently such as will lie flat, the one against the ceiling and the other against the wall when used as a cornice. The next thing will be to show how the fixing may be managed. There are other means, no doubt, but this is the mode of procedure that I myself adopt.

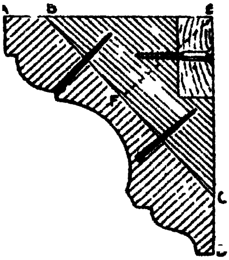


Fig. 153. Specimen of Moulded Cornice.

Good moulding for cornice of small room and furniture.

Fixing moulding round ceiling of room.

271. I have said that the diagram shown in Fig. 153 is half size, and is consequently on a scale of ½ inch to 1 inch, or 6 inches to 1 foot. The first thing to be done is to cut out a number of triangular pieces of the same size, similar to that shown by B E C. The best and most economical way of doing this is to prepare some slips of white deal about 1¼ inches or rather less in width, and to plane them down truly and accurately to the width required, which, as shown by the dotted line, E F, is very nearly 1$\frac{5}{16}$ inches or 1$\frac{5}{16}$ inches bare. If one of these triangles be set out on the slip, the side B C, coinciding with the edge of the slip, and straight lines be drawn at requisite distances on either side, namely, B C, the distances on the opposite side being set off from the point E, it is manifest that if the straight lines be drawn zigzag fashion from B to E and from E to C, and then from C to the next point, the slip of wood will be divided into as many triangular pieces as its length will allow, all of equal size. I have further shown this in Fig. 154, in which the right-angled triangle is first drawn. Then by marking off A C, C E, and D F, equal to D B, and drawing C D and E F parallel to A B and C F parallel to A B, we get the four similar and equal right-angled triangles, B A D, A D C, D C F, and C F E.

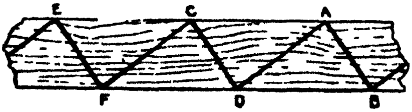


FIG. 154. Division of Slip into Triangles.

Preparation of triangles for fixing.

272. Reverting to Fig. 153: when a sufficient number of triangles have been cut, always remembering that the base or hypothenuse of each triangle should be in the same direction as the grain of the wood, and it has been ascertained that they are equal and similar in every respect, we may make preparations for fixing them. For this purpose, some stringing slips must be cut; and in this case the utmost that we can allow for the size of the slips is ⅞ × ⅜ inch. These should also be of white deal, and they should be cut out of ½-inch board, and planed down on each side until the required thickness has been obtained. The strips should be cut 1 inch in width, to admit of planing the edges. The number of triangular pieces will depend entirely on the size of the room; but it will be as well to rest on the number first of all, on the supposition that for every foot of stringing slip a triangular piece will be required. Thus if a room be 15 feet by 12 feet, we shall want 54 foot run of slips and the same number of triangles. Next, cut in each triangle a recess as shown at E, into which the stringing slip is dropped, after an accurate division into lengths of 1 foot has been carried out on the slips, so that the exact place at which to place each triangle may

be known at once without any further trouble. This mode of procedure will be found to save much delay and waste of time. The triangular pieces should then be placed on the bench, each on the hypothenuse or longest side of the triangle, so that the recess in each may be uppermost. Then drop a slip into the recesses of the triangular pieces thus arranged, and proceed, after seeing that they are at equal and regular distances, to screw down the slip to the triangles with ⅞ screws of No. 7 size. The slips and triangles having been attached, the next thing to be considered will be how best to fix them to the wall.

273. This will depend very much on the condition of the wall. If the plaster will hold the nails, it will be sufficient to drive a nail, either a wire nail, a brass-headed nail, or a long clout nail, through the centre of each space of slip between every pair of triangles in succession, first between Nos. 1 and 2, then between Nos. 2 and 3, and so on on each side of the room until the foundation for the moulding has thus been carried entirely round it. The slips must be mitred at the angles of the room and on each side of the chimney breast, if there be any. It is better to put too many nails through the slips and into the walls than too few. If there be any doubt about the plaster being strong enough, and the walls penetrable enough to take the nails, recourse must be had to plugging, except where there may be a partition, in which case the studs must be sought for by tapping the wall with a hammer, when the difference in sound between a blow on the stud and the hollow lath and plaster will soon reveal the position of the former. It is not so easy to detect the position of the studs in a brick noggin partition, and it may be needful here to search the wall by driving in a small bradawl. The method of plugging a wall with as little damage as possible to plaster and paper has been already described in a previous chapter.

Fixing triangles and slips to wall.

274 Lastly, the cornice moulding must be attached to the triangles; and this part of the work, and, indeed, the fixing of the slips and triangular pieces, will require two pairs of hands, as one worker must hold the fitting, whether it be slip carrying the triangles or the worked part of the cornice, while the other nails it up. First of all, the cornice moulding must be placed in position, and bedded against the hypothenuse of the triangles, the part A B (Fig. 153) butting against the ceiling, and C D against the wall. Oval brads ⅞ inch or 1 inch long should be used, and these should be driven in in the positions shown. The brads must not be driven home with the hammer, but when about ¼ inch of the brad is left

Fixing the cornice moulding.

above the wood, it must be driven home with a small light punch, the head being finally driven below the wood by the same means. This will prevent any bruising of the edges of the mouldings of the cornice with the hammer, which would be sure to occur if the brads were driven home with it; and if the sharpness of the mouldings were injured, the beauty, clearness, and finish of the whole work would be at once destroyed. When fixed, all that remains to be done is to colour the cornice in appropriate tints. Oil colours, or Gypsoline, should be used on wood. The cornice described is only fitted for a small room or for furniture, but larger ones may be selected from Mr. Elliott's patterns; or a combination of mouldings may be used to form a broad cornice, though in this case it will be difficult to obtain the effect which is produced by the introduction of a deep caving.

Armorial bearings as ornamentation for cornices.

275. When writing in AMATEUR WORK, Mr. Mark Mallett ably described the ornamentation of a cornice in a dining-room or entrance hall with shields, emblazoned with armorial bearings, properly painted in heraldic colours. The proper form of the shield to be used for such purposes has been shown in Fig. 82, page 101. These would look best when affixed to a coved cornice; but when such a form as this is beyond the reach and beyond the skill of the home carpenter, he may try the effect of a flat board with bevelled edges above and below, to butt against wall and ceiling. The shields should be affixed to this flat member of the cornice, relief being obtained by cutting out the shields from wood from ⅜ inch to ½ inch in thickness. Narrow but prominent mouldings should be affixed to the board above and below the shields, which should be from 4 to 5 inches in length; the intervening spaces between the shields may be painted in arabesque work, in shades of one tint, so as not to detract from the colouring of the shields, or finished with Japanese paper. A gilt band would look too massive, and spoil the effect of any shield whose field was gold, or *or*, to speak in heraldic terms; but a neutral tint for the band, with a key pattern or Greek honeysuckle in gold, relieved with a darker shade of the neutral tint, would present a handsome appearance.

276. Let us now see how far it is possible to get a good cornice by other means, and how amateur wood workers living in our distant colonies who have no chance of availing themselves of the timely assistance to be derived from the use of wrought mouldings supplied by Mr. Elliott and other makers, may work out a moulding for themselves which will answer the purpose, although it may not come up to the real article. Here is one in Fig. 155 that would not present any difficulty of construction, as it may be built up

bit by bit. It is not very handsome in appearance perhaps, but it may be useful to some in its actual form, and to others in suggesting a variety of forms which may be as easily made and would look better. First of all, two pieces of board, from ½ inch to ¾ inch in thickness, are attached to wall and ceiling, the upper one A screwed through the lath and plaster to the joists, and the lower one B nailed to the wall. The edges of these boards, as shown in the diagram, are chamfered deeply, to take off from the heavy appearance that a square termination in each case would naturally present. Screwed on to these are two pieces of wood, moulded as shown on the outer edges, and placed as indicated by C and D. These need not run to the innermost boarding, but have a hollow unfilled space between their inner ends and A and B, as shown by the unshaded portions of the diagram. They are about twice the thickness of A and B; and the screws by which they are attached, for a reason that will appear presently, are to be inserted in the direction shown by the dotted lines. Between these is fitted a central member E, which may consist of a square piece of wood, planed away until the arris is reduced from the adjacent arris above to the adjacent arris below, and the whole assumes the form of a quadrant, or quarter of a circle. There is no difficulty in doing this. I suggest the square form because it will be easier for the home carpenter to reduce by planing; but if he will take the trouble to get hold of a thinner piece of wood, of which the dotted line indicates one side, chamfer the edges until they form, when produced, a right angle, and will butt against the ends of D and G, there will be less waste of material, and the weight of the cornice will be yet further lightened. This will need no attachment, for it will be held in place by the semicircular mouldings F and G, which are mopstick mouldings, made by sawing a mopstick or broom handle in half longitudinally from end to end. The mopstick mouldings must be held in place by bradding them on to C and D, in the direction indicated by the dotted lines. The cornice would look better if E were a coved instead of a salient member; and if C and D were thinned away a little more from beyond the part coved by the mopstick moulding upwards towards the boards A and B, it might look lighter; but I am describing a cornice for the benefit of the unskilled, or perhaps half skilled amateur wood worker at home and abroad, and not one that is distinguished by beauty of sectional outline, and so I have given him as little work in making it as I

Symmetrical built-up cornice.

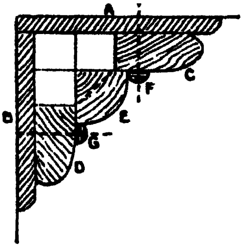


FIG 155 Built-up Cornice.

possibly can. I have said that the mopstick mouldings are bradded on with brads inserted in the direction of the dotted lines. The brads, of course, enter C and D at intervals between the screw heads, which are concealed and hidden from view by the mouldings at F and G. Thus nothing appears, even before the cornice is painted, but the holes where the heads of the brads have been driven in, and these are stopped with putty in the usual way, used plain if painted, but coloured with yellow, red or brown ochre if the work is to be varnished.

277. We will now dwell awhile on the imitation of mouldings; and we shall soon see how, by building up, it is by no means a difficult matter to imitate—I do not say copy—most forms of moulding, on a large scale by building the home-made moulding up piecemeal or bit by bit. I lay stress on the word "copy" because manufacturers' mouldings are mostly copyright; and although we may not, or ought not, to make an exact copy even for private purposes and use, we can adapt, and take hints and suggestions from mouldings before us, and recast them to suit our own requirements and need. The section shown in Fig. 156 is based on one of Mr. Elliott's designs, but it differs from it in many important particulars. I will not trouble the reader or myself with dimensions of the several parts: it will be enough to say that the diagram is half size or thereabouts, and as such is drawn on a scale of ½ inch to the inch or 6 inches to the foot, as many of the diagrams previously introduced have been. Now, in building up the moulding shown in section in Fig. 156, the

Imitation versus copying.

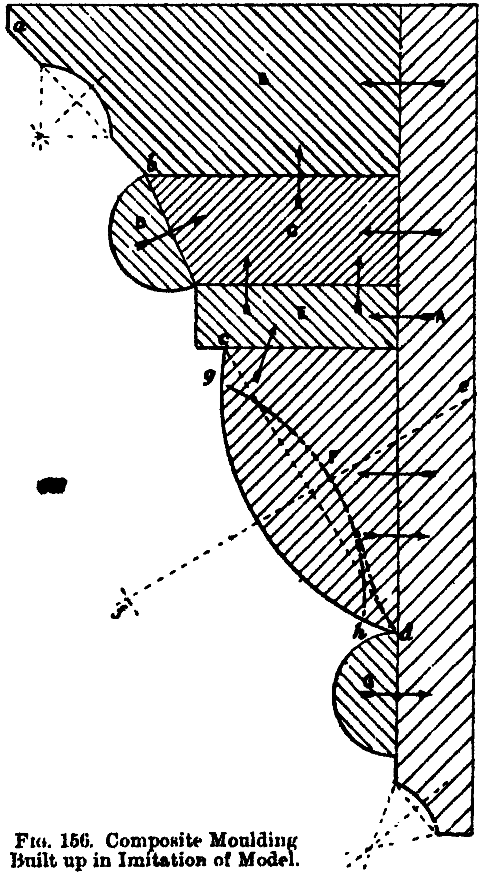


FIG. 156. Composite Moulding Built up in Imitation of Model.

first thing required is a long piece of board, marked A, which may be appropriately called the backbone, since it serves as a basis to which all the heavier and larger pieces of the moulding or cornice, call it which you will, must be attached. The board A is, as a matter of course, plain throughout except at the outermost lower arris, which may be merely removed in a wide chamfer, as shown by the dotted line, or grooved, as shown by the solid line or arc which the dotted line subtends. In making a working drawing the chord must be bisected, and a line drawn through it at right angles to it. The centre of the arc will lie in this line, and will be found by striking arcs of circles across it from each extremity of the chord as centres, and the length of the chord itself as radius. The topmost horizontal member B is the largest and heaviest of the whole. In this the lower of the two arrises in front is taken off from *a* to *b*. It will greatly improve the appearance of this as well as the chamfered corner if A be grooved. To do this divide *a b* into four equal parts. Through the central point of division draw a line at right angles to the surface as obtained by chamfering. Construct a right-angled triangle on the two central divisions, and from the apex as centre, with one of the sides of the triangle as a radius, describe the arc shown by a dotted line. There is but little, if any, difficulty in making the shallow grooves shown, as they can be taken out with a piece of steel or iron, cut to shape, sharpened at the edge, and held in a router made on principles shown generally in page 56. When finished A and B must be connected by screws, passed into B from the back of A in the direction of the arrow; the attachment of every member is shown by arrows.

Construction of mouldings.

278. The member C presents no difficulty whatever. The front edge is bevelled off as shown, and it is attached by screws through A and to B by long brads or wire nails driven in in an upward direction. A mopstick moulding B is bradded on to the bevelled edge of C as shown. The narrow rectangular member E is bradded on to C with wire nails driven upwards, and further secured by wire nails through A. Next comes the large member F, which may be treated in two different ways. Having determined the points *c* and *d* on E and A respectively, draw the dotted line *c d*; bisect it, and draw through the point of bisection the straight line *e f* at right angles to it. In this line lies the centre *e*, from which the solid salient arc that bounds F is struck, and which should be retained. If, however, it be desired to form a coved recess in it, the centre from which its outline, shown by the heavier dotted line is struck, will be found to be at *f*. If this form be adopted, the line *g* should be at right angles.

Lesser members of cornice.

to lower surface of E, and a better appearance would be obtained if the lower part of the curve were taken off to come to nothing at *d*. If the bolder outline be adopted, which to my mind is preferable and easier for the amateur wood worker, it must be attached to A by screws: but the alternative form must be attached by brads through the upper part to E and through the lower part to A. The last member G is merely a repetition of the mopstick moulding shown at D.

279. No more, I think, need be said about cornices; for the reader already knows where to get them if he desires to have them ready made and moulded to his hand, and how to make them if he takes to building them up The chair rail may be managed in much the same way; that is to say, it may be purchased if desired, or made either by working it with ploughs and routers, or by building it up. The home carpenter will, I am sure, prefer the latter way. A few brief remarks on their utility and general principles may be desirable. In the seventeenth and eighteenth centuries, when wainscoted rooms were far more common than they are now, the chair rail formed a bold line of demarcation between the shorter panels below and the larger panels above; and its boldness and prominent projection were not noticed because they harmonised with the depth of the framing in which the panels were set, and the boldness of the moulding which was run round the framing on its inner edge. And more than this, the edges of the panels themselves were moulded more frequently than not, and thus the broad central space of the panels themselves were thrown forward into prominence. Their object and chief point of utility was to prevent heavy furniture and chairs from being set back against the wainscoting further than the most prominent member of the chair rail would allow. Latterly, the chair rail, or rather the simulation of the chair rail, has become common through the re-introduction of the dado by papering the lower part of the wall surface in a different style and with a different paper to that used for the upper part. It is not a style to be admired; but "every dog has its day," and, like other things, it will doubtless soon become a thing of the past. It is the imitation on a flat surface throughout that I do not care for. I like the use of the chair rail as a member that comes into prominence to a greater degree than the surface of the wall itself and to the same extent as the skirting; because, in this case, its utility as a chair rail is again brought to the front, and while the part above and the part below can be differently treated, the treatment can be effected in a more desirable manner than by paper and paper only. Nothing can look better than a room divided by a chair rail into two

About chair rails: their use and general principles.

parts, dado and wall surface above, each being covered with Gypsoline, wrought all over by hand into suitable forms, which exhibit light and shadow throughout, and are tinted, the former with a darker shade and the latter with a lighter shade of the same tint. But better still to my mind is a room in which the upper wall surface is finished in the manner described, and the lower surface or dado panelled with the natural wood, and mocked as I will show presently, the wood work being varnished.

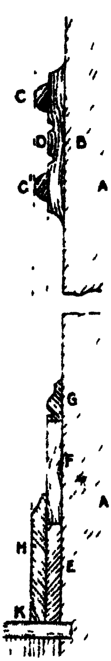
280. In no case, however, must undue prominence be given to the chair rail; that is to say, the basis of the chair rail, if made up of various members, must not be too thick, and the members with which it is partly overlaid must not be too prominent. The first room that I ever fitted with a chair rail was a kitchen that wanted cleansing and re-papering; and I spoilt the look to a great extent by making the chair rail too thick and clumsy, instead of light and shallow. It was fortunate that it was the kitchen, although that is no excuse for my want of foresight in dealing with the matter. I will show the form of chair rail that I adopted presently, but the sectional diagram shall be drawn more in accordance with my modified views brought about by experience. Meanwhile, in addition to this caution to my readers never to make a chair rail too thick, let me further warn them never to permit the upper edge of the chair rail to assume the form of a square or rectangular commencement in which the uppermost surface is at right angles to the wall, and the vertical surface that follows a sheer perpendicular descent from the arris or outer edge of the former. The reason is that it forms a lodgment for the dust, which is never slow to gather in its deposition, and which is too often left to accumulate far longer than it ought without dislodgment or removal by brush or cloth. I say nothing about the ugliness of form, which will be at once apparent to my readers. I was asked in 1889 to go over a house of some pretensions in a southern suburb of London, which had been newly done up through and throughout with Gypsoline, and which was a show house for the exhibition of the excellence of this new, beautiful, and easily applied colouring matter; but the first thing that met my eye was a chair rail thus fashioned, that ran from top to bottom of the staircase from entrance hall to attic; and it was just the "fly in the ointment" that spoilt the whole show in this part of the house, as far as I was individually concerned.

Form of chair rail in modern ornamentation.

281. But let us now to our formation of chair rails; and first of all a form that is useful for general adoption. This form is shown in Fig. 157, and it will be noticed that the leading features in this are prominences in the

upper and lower parts of the rail and an utter absence of them in the middle. The chair rail, it should be said, should never project beyond that member of the skirting which assumes the greatest prominence; that is to say, the greatest projection of the skirting and the greatest projection of the chair rail should be in one and the same vertical plane, and if either chair rail or skirting have a greater degree of prominence than the other, it should be the chair rail. This is shown also in Fig. 157, in which it has been sought, for the sake of economy in illustration, to kill two birds with one stone: that is to say, the necessity of preventing the chair rail from overhanging the skirting as well as a form of skirting well adapted for ordinary use. It will be as well to name the different parts of the diagram before proceeding any further with my argument with regard to the relative proportions of chair rail and skirting. We will suppose the room to be a room of the plainest kind, which the amateur workman has supplied with a small cornice, and now seeks to break the monotonous surface of the four walls yet further by the addition of a chair rail and the extension of the skirting. In Fig. 157, then, A A represents the wall broken in its continuity, because it is neither possible nor absolutely necessary to show the entire wall surface intervening between chair rail and skirting. Taking the chair rail first of all, B represents a rail about 3 or 3½ inches in width, and about ½ inch thick, whose upper and lower arrises have been chamfered away almost entirely, or, as the saying goes, "almost to nothing". If the top and bottom slanting surfaces thus obtained are grooved with a shallow hollow, they will look better, perhaps, than if left straight; but in this every workman who is inclined to follow my plan must please himself, allowing the form of edge adopted to suit his fancy or his skill in wood working. If it be asked, Why not leave the edge plain and square? I must remind my interrogator that such an edge, proceeding at right angles to the vertical surface of the wall, would have a clumsy and heavy appearance, and would afford a lodgment and resting-place for dust, which should always be avoided. C and C′ are two light mopstick mouldings, about ½ inch in width, and therefore about ¼ inch deep, bradded on with ⅝ inch or ¾ inch brads, the former being preferable. Under C and above C′ a slight groove has been channeled to diversify the surface D between the two mouldings, which would otherwise remain flat and without any relief whatever.

General relations of chair rail and skirting.



Chair rail.

FIG. 157. Plain Chair Rail and Skirting.

The skirting.

282. Turning now to the skirting, it will be well for the workman to remember that the flooring, represented by K, is put down before a room is plastered, and is butted against the surface of the wall or partition, as the case may be. Then the plaster is put on, too often in an anyhow kind of way; and that the junction between plastering and flooring never shows to advantage. To hide this, a skirting board is run round the room, which in the room we are supposing to be under treatment is extremely narrow, and at the best a mere apology for a skirting. This is represented by E. It is very narrow, being no more than 3 inches in width at the very utmost. Here let me say that the diagram in Fig. 157 is not drawn to scale, and is merely a sketch diagram: the reader will do well to work out a figure for himself according to the dimensions given. The amateur wood worker proceeds to widen this narrow skirting,—which, by the way, is of the same thickness as the chair rail without the mopstick additions —by nailing to the wall immediately above it another strip of the same thickness, and about 3½ inches wide; and this he finishes at the top by nailing on to the upper edge an O G moulding of small size, put on in the way shown; or else a piece of wood about $\frac{5}{8}$ or $\frac{3}{4}$ inch wide, with the upper corner rounded away along the arris, and sloping away gradually from the edge next the wall outwards. This addition is known as a "quirk". The new piece added on to E, the original skirting, is represented by F, and the moulding or quirk, whichever may be used, by G. Having done this, the workman will object to the ugly appearance of the line of junction between E and F; and he will proceed to hide this by adding another member to the skirting in the form of a strip about 4 inches in width, with the upper edge chamfered away, so as to leave but a very narrow surface projecting from the inner member at right angles; and this chamfered surface may be grooved, as proposed, for the upper and lower edges of the chair rail. In any case, the treatment of the additional member of the skirting, represented by H, should be the same as that adopted for the edges of the chair rail; that is to say, if one be chamfered, the other should be chamfered; and if one be grooved or hollowed, the other should be grooved or hollowed also.

Relative proportions of chair rail and skirting.

283. In the diagram itself the chair rail has been drawn somewhat broader than it ought to be, taking the breadth or depth to be from top to bottom on the inside next the wall; but this could hardly be avoided, as it was sought to show the form of the chair rail as clearly as possible, without resorting to another diagram. If in actual proportion it would not be as thick and as deep as it is shown in Fig. 157,

but it will serve all the better to enforce what I have said, and what I have to say, on the relative proportions of chair rail and skirting. On this account, it has the appearance of slightly overhanging the skirting below, though in reality it does not, as is shown by the dotted vertical lines parallel to the surface of the wall. What would it have been if the rail B with the mopstick mouldings C and C′ had really exceeded the thickness of $\frac{3}{4}$ inch in its projection beyond the surface of the wall? In the first room I treated in this way, I fell into the error of making the rail B too thick, and the mouldings C C′ too wide, and therefore too prominent; so I am all the better able to warn any amateur wood worker against doing the same. When chair rail and skirting have been put up, the home carpenter will either tint the dado thus produced between these additions, or he will put up paperhangings In either case, the tint should be of a darker shade for the dado, and if paperhangings are used for the covering of the walls, that which is applied to the dado should be of a darker tint and different pattern to that which is used for the wall above the chair rail.

Treatment of loose plastering.

284. In the house that was built by "Poor Old Uncle" there was a room in which the plastering bulged outward in one part to a considerable extent; so much so, indeed, that when I first caught sight of it, I was unable to account in any way for the abnormal appearance of the wall, unless it were that the studs in the brick nogging, or lath and plaster partition, were bowed in form, and that the lathing had of necessity followed the form of the studs. On looking, however, on the other side of the partition in the adjoining room, I found that everything was pretty much as it ought to be, and that there was nothing to complain of there. This led to a closer examination, when I found that the plastering yielded to the touch, and was therefore loose. It was not difficult to assign a reason for this; and the conclusion I came to was that the lathing had been badly put on, the laths being nailed on so close together that the plaster had not properly "keyed" into them; that is to say, had not penetrated to a sufficient extent to admit of the lathing and plastering holding together. To re-paper the room on loose plastering would have been unwise; so I left it, intending to have the loose stuff cut away and the lathing removed. But the re-lathing and re-plastering would have been first a dusty and then a wet and dirty job, which I was reluctant to tackle; and the room continued in this state until it passed into the hands of the next owner and occupant. What he may have done with it I do not know; possibly, he has put up with it, and put new paper on the loose stuff. I will tell my readers what I should have done, and what

they might do if they found a wall in the same predicament. I should have ascertained the extent of the loose plastering, and had the square that contained it cut away. I should then have had plastering already done on lathing attached to slight uprights, which would have entered the spaces between the studs; and then I should have brought this in perfectly dry and ready for fixing to the old studs with screws put through the laths and buried in the plaster. Although I could not have avoided the dirt and dust arising from the removal of the old work, I should have escaped the wet mess involved in new lathing and plastering in the ordinary way, and waiting for the wall to dry out before it could be re-papered. This is done in a large way by two or three firms and companies; and what these can do in a large way the home carpenter can do, or, at all events, try to do, after his own fashion in a small way.

Patterns of chair rails and skirting boards.

285. Those who possess the necessary skill in wood working and the necessary tools, can work chair rails at pleasure out of the solid; and those who do not, can at all events build up a tolerable semblance and approximation to any form they may particularly wish to have. I give in Fig. 158 some suggestions for chair rails that are not very difficult to work, and tolerably easy to build up. Those who wish to try their hand at building them up may arrive at the right way of going to work by drawing a full-sized sketch of any of them, and making it in full lines as a working drawing. A dotted line, vertical, and parallel to the back of the chair rail, should then be drawn at such a distance from the back as may show a flat member behind, chamfered or grooved more or less at the upper and lower outer arrises, or even recessed, and leaving the other parts projecting as it were from the member behind. These will have to be worked out independently, and bradded on. In some of them pieces cut from curtain poles may be used for the broader rounded work. In A, perhaps, the most difficulty will be found, but it is by no means insuperable. The flat band in the middle of B may be utilised for enrichment by chip carving, or for the reception of very shallow circular, oval, or lozenge-shaped pateras, which may be plain, or carved, or turned, according to the taste and skill of the workman. I have explained what I mean by these in Fig. 159. When the pateras assume the form of very thin plates, cut from fret wood with the fret saw or fret-sawing machine, as shown at A, B and C, they

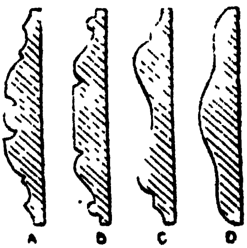


FIG. 158. Suggestions for Chair Rails.

Pateras on chair rails.

may be affixed to the band in a room used for ordinary purposes, without fear of injury either to the pateras or the chairs; but when they are rendered more ornamental in character, as in the flattened pyramidal form shown at D, or enriched with incised work as at E, or carved in low relief as in the heraldic or Tudor rose at F, their use should be confined to rooms and places where they are not liable to injury from the chafe or likely to mark the chair backs. Of these, D perhaps is the most liable to come to grief or to cause grief, E, being incised work, can be used anywhere as readily as its prototype B above it, and will have a very pleasing effect, but the heraldic rose will run a greater chance than any of getting damaged. This last, however, will look very well if so rounded at the back as to be set at intervals in the large hollow of the chair rail shown in section at C in Fig. 158. And with this I must bring my remarks on chair rails to a close.

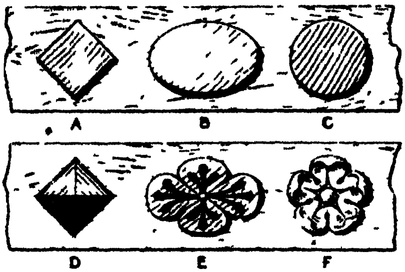


FIG. 159 Suggestions for Pateras on Chair Rails.

286. About skirting boards little if anything can be advanced beyond what has been already said: and as the extension and development of the skirting board is nothing more than a piling on of member after member, each projecting, for the thickness of the boarding used, beyond that which is immediately above it. The only means of enrichment of skirting boards is by breaking the joint so to speak, by running a bead along the outer edge of the top of any member, and relief may be obtained by reeding or running a number of beads of small size along the surface of a member, at a little distance below the arris or beading that has taken the place of the arris Failing this, grooving may take the place of reeding, or, to speak more definitely, and perhaps intelligibly to the home carpenter, hollows may take the place of beads. But, whatever may be the kind of enrichment that is adopted, it must of necessity assume the form of long parallel and horizontal lines. Chamfering may at any time take the place of beading, in the upper and outer arris of any member; for stop chamfering there are no opportunities.

Enrichment of skirting boards.

287. The introduction of gilt slips wherever it is practicable is to me a consummation of enrichment devoutly to be desired; and, when a thin band of gold has been introduced below a cornice, the same thing may be done with advantage on each side of the chair rail and above

Gilt slips about chair rails, etc.

the skirting board. The amateur decorator must take care not to have his gilt slips too large, and therefore too pronounced. A narrow slip is sufficient for all practical purposes, its *raison d'être* being relief and definition combined. On doors I very much like a little gilding. I think I have said that my study is a room in a cottage adjoining the house, and in this I have my workshop, and various store rooms. The only colouring on walls and woodwork is terra cotta and white, with the palest possible brown. This faint tint of brown forms the groundwork of the paper, and indeed is the colour of the paper itself, before the pattern was printed. The pattern on the ground is white, the forms of the leaves being defined by terra cotta lines, the flowers having a circlet of terra cotta stamens, or quasi stamens, encircling the central portion, and forming, as it were, a chaplet from which the petals proceed or issue. It was the only thing I could find in the pattern books for 1893 that I liked, and so I used it. If I am asked why I selected this particular colouring, I may say that it was because I possessed a large tin can of terra cotta colour sent me, as a specimen of their paint, by the Torbay Paint Company, and that its use involved me in no extra expense. When done, the walls, window, the cornice above it, the *quasi* beam that crossed the ceiling, the skylight affording me an excellent light from above, while with a margin of terra cotta mopstick moulding on the ceiling, just by its edge, looked just as it ought to look: but the door, with some matchboarding by the side, together forming an obtuse salient angle entering the room, looked heavy in its terra cotta colouring, unbroken throughout by any relief. The matchboarding was easily subdued *pro tem.* by hanging a bright floral group consisting of lilies in the upper compartment, and a cupboard will soon hide the lower panel, when I can find time to make it. To lighten and brighten the look of the four-panelled door, with as little cost as possible, I ran a beading of white mopstick moulding, about ⅜ inch wide, round the panels, bradding it on the inner edge of the rails and styles; and the edges of the panels butting against both rails and styles will be surrounded by gold or gilt slip. The combined framing of white and gold will very effectually break up the dead mass of plain colouring.

Treatment of door.

288. I have been betrayed into giving the above sketch in words, of the room in which I now work, to show the utility of gilt slip in decorative work; but I must now turn my thoughts to dadoes, and say a few words about them. And in speaking of dadoes now I do not mean the *quasi* dado simulated by paper, but of an honest wooden dado, which may be made not only useful but attractive by the use

The genuine dado—its form and purpose.

of various kinds of wood. The kind of dado that I have in my mind is easily and quickly made. It will proceed from and rest upon the topmost member of the dado which should project beyond it, and be rebated within, so as to receive the lower edge of the panelling, or rather the framing in which the panels are set. If possible, the dado should be placed in position before the chair rail and highest members of the skirting board are put on. I will now take a dado of the simplest form, and we will see how it is made from commencement to finish. Being an entirely independent piece of panelling, both topmost members of the skirt and the chair rail itself will assume different forms to those already described.

289. And now a diagram will be necessary, on the principle that just as a little showing is worth a great deal of telling, and generally of much more avail, so a little illustration often conveys much more than a long description, and, at all events, is very helpful to the better comprehension of the latter. **Plain panelled dadoes.** The method of making a plain dado is shown in Fig. 160, which affords the key to the construction of all others, whatever may be the form and whatever the enrichment or ornamentation that may be added. First of all, the skirting board must be treated for the reception of the panelling. In Fig. 160, it will be seen alike from the elevation and section **Skirting board.** that it consists of two members a thicker and more substantial one within, and a thinner one without. The thinner member is chamfered or hollowed along the upper and outer arris according to the taste of the workman. As I have said already, the skirting board forms at one and the same time a basis and support for the panelling, and must be so constructed as to provide for the retention of the lower rail of the framing of the panelling in its place. Then comes the panelling itself, consisting of the panels and the framework that surrounds them, and this forms the second or **Panelling and chair rail.** intermediate portion of the entire structure, and last of all comes the chair rail, which forms a capping and finish to the whole; and, just as the skirting board is made to lap over the edge of the lower rail of the framing and keep it in its place, so the chair rail is fashioned to lap over and keep in its place the upper rail of the framing, resting upon the upper edge of the rail.

290. It is always desirable to work upon some pre-arranged plan of procedure, and in this case, after explaining generally the construction of the panelling, I will enter more minutely into the construction of a panel and the adjacent portions of skirting board and chair rail according to scale, and then again go into generalisation in the form of a few remarks on the method of

carrying a dado round the room, and the distribution of the space to be covered in such a manner that the panelling may appear duly proportioned all round the room, and so treated as to avoid as much as possible any undue departure either one way or the other from the width that it has been determined to assign to the panels generally. As a matter of course, there must be a departure in some cases; but even the departure itself must be influenced by regularity, and depend entirely on circumstances, or accident, if you like to call it so, of position. And first, with regard to the construction of the framing of the panels, let me call the attention of the amateur wood worker to the fact that in making a door the uprights or styles run vertically the whole height of the door, and the horizontal rails are mortised into them. The muntins of the door, however, are carried vertically from rail to rail, and mortised into the rails. Now, the question naturally arises, whether it will be better to treat the vertical parts of the panelling as styles or muntins. The rails must extend as rails, continuous and undivided, except where a joint is absolutely necessary, along each side of the room, and we now wish to determine whether the uprights shall assume the form of styles or muntins. I say *assume* the form, because in making a dado we are not making framing grooved in the regular way, and mortising the uprights and horizontal pieces of the framing together; we are simply resorting to mocking, to present the semblance of a properly constructed framing without the reality, and uprights and horizontal parts must be halved together. It will help us in coming to a decision if we take it that, as a general rule, the *shorter* parts shall be mortised into the *longer*, just as the rails of the framing of a door are mortised into the styles. In short, turn a door on its side and let the styles appear as rails and the rails as uprights, and we arrive at once at a settlement of the matter without any further trouble, and the establishment of our own rule to guide us in all other cases of construction of this kind; so in making the framing or *quasi* framing of our panelling, we see at once that the uprights must be treated as muntins, and that the ends of the muntins must be notched in front, and the rails notched to receive the halved ends of the uprights from behind, and the joints fastened together with wooden pins. This, in fact, is the plan of jointing that is shown in Fig 160, the unbroken line at the top and bottom of each upright, showing how and where it butts against the rail, and the dotted lines the continuation of the notched ends of the uprights to the outer edge of the halvings cut in the rails to receive them, these halvings being taken out, as already stated, from the back of the rail.

Construction of panels.

Height of chair and dado.

Working drawing.

291. Let us now try our hand on the construction of the panel of a dado according to scale, so as to arrive at some idea of the relative proportion of the different parts, respecting which we are at present somewhat in doubt. The height of an ordinary dining-room chair is 2 feet 9 inches. I am, of course, speaking of the height from floor to top of back, and not "chair height," or height from floor to surface of seat, which is 17 inches. Our dado, then, to be useful and effective, as far as the chair rail goes, should not be less than 2 feet 7½ inches, nor more than 2 feet 10½ inches. Let us take a medium height, 2 feet 9½ inches, and make our working drawing here on a scale of 1½ inches to 1 foot Practically, the actual working drawing should be on a much larger scale, say 6 inches to 1 foot, if not full size, because then all the details can be completely worked out on paper in a thorough manner; but this is as large as the limits of our page will permit. From the working drawing now before us, we will make a single panel, treating it as if it were a panel made for exhibition in a window, or elsewhere, to call attention to any particular style of making, or as a groundwork on which to show a grainer and decora-

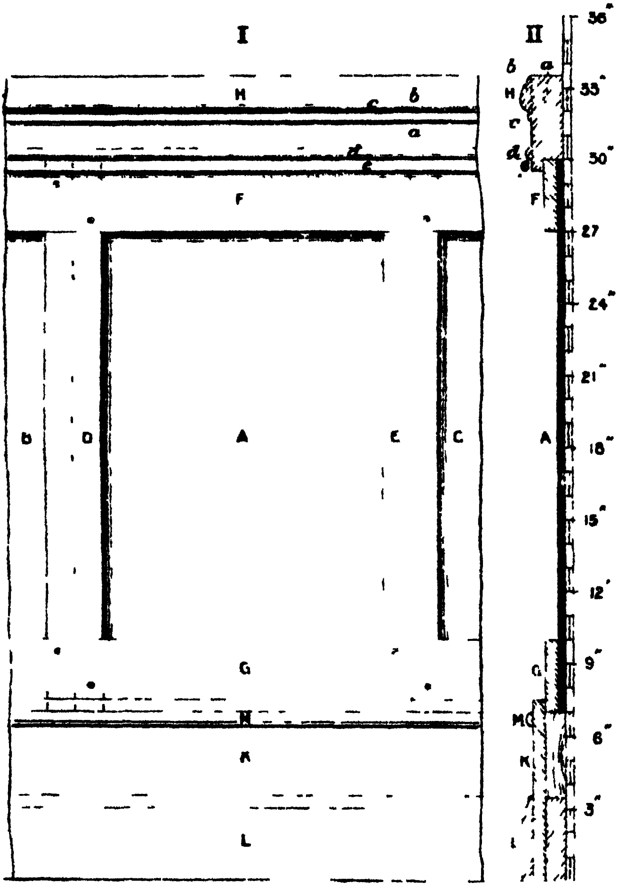


FIG 160 Panel, Framing, Chair Rail and Skirting Board of Dado, to scale of 1½ inches to 1 foot in Elevation (I) and Section (II)

tor's skill in producing a semblance to any particular kind of wood or variety of marble. The sizes of the different parts are determinable without the slightest difficulty; for to help us in this respect, a scale of feet and inches has been erected at the back of the section shown in Fig. 160, from which the length, breadth, and thickness of any part can be ascertained at once without any trouble whatever.

Dimensions of the dado panel and its different parts.

292. Looking at the scale of inches we see at a glance that the height of the dado from floor to the top of the chair rail is 33½ inches, and that, practically speaking, as far as external aspect goes, the chair rail itself, from its highest point to the *lower* edge of the overlapping band that contains the panelling at top, is 4 inches. Next to this comes the panel and its framing; and this part, which includes the top rail, the panel, and the bottom rail, or, at all events, as much of it as can be seen, is 22½ inches. Lastly, the third or lowest part, comprising everything that forms part of the skirting board, from the *upper* edge of the containing band that holds in place the lower rail, is 7½ inches. To show that our reading is correct put it in this way: 4" (chair rail) + 22" (panel and framing) + 7½" (skirting board) = 33½ inches, or 2 feet 9½ inches. I might, and perhaps ought, to have taken *the* medium or intermediate height between 2 feet 7½ inches and 2 feet 10½ inches, which is 2 feet 9 inches; but I have preferred to deal with an extra ½ inch and say "*a* medium height," instead of taking "*the* intermediate height," to show my readers that there is no difficulty in dealing with the odd ½ inch. In point of fact, whatever may be the height at which it is determined to make the dado, the chair rail and skirting board might remain a fixed quantity, unless it were determined for any good reason to increase or diminish their depth or height, call it which you will; and then if the dado be *less* than the average height, the inches by which it is diminished may be *taken from* the height of the panel and its framing, and if *more*, then the inches by which it is augmented may be added to the height of the panel. Actually, the height of the panel, on the hypothesis on which we are proceeding, is 23 inches, instead of 22 inches, because we have been dealing only with external and visible parts, and therefore were not called on to measure in the parts that are duplicated in the total height of 33½ inches, namely, the upper and lower ½ inches of the panel and framing which lie concealed, the former behind the containing member of the chair rail, and the other behind the containing member of the skirting board; *visibly*, then, the heights of the three parts, chair rails, panel and framing, and skirting board are 4, 22, and 7½ inches, *actually* they are 4, 23, and 7½ inches.

Height of panel.

Width of panel.

The width of the panel and its framing, that is to say, the upright on the right and the upright on the left, is 17½ inches, this being made up in this way: 2½" (left-hand upright) + 12" (panel) + 2½" (right hand panel) = 17 inches; but actually the panel itself—supposing the wood work of which the panels are composed to be contiguous as well as adjacent, and thus being co equal throughout to cover the entire surface of the wall—is 14½ inches. The actual extent of the thin wood work, composing the panel, is in width 14½ inches, and in height, as already shown, 23 inches. Practically, as long as the panel itself is of sufficient length and breadth to be covered by the edges of the framing, it does not matter if one, or, indeed, any number of them, be less than the full average size, for it can always be affixed to the plastering with wire nails in the position required before the framing is put on. Hence, any odd piece of fretwood of irregular outline can be used as a panel, provided it is covered all round by the edges of the framing, due regard being had to squaring off any redundant projections to meet the exigencies of adjacent panels, and to let all the pieces fit flat against the wall.

Parts required for panel, as per diagram, with sizes.

293. Now, let us sum up the pieces of wood that we shall require to make our specimen panel, as depicted in Fig. 160, and jot down the sizes of them. I will give the dimensions in the sizes they will ultimately assume when planed down, and ready to be put together. In actual work the pieces should be rather larger, to admit of reduction by planing, etc. Taken in this way, the pieces required will be:—1 piece for centre panel, A in section and elevation, the sectional view, against the scale of feet and inches being rendered in black for the sake of distinction: this piece, as already shown, should be 23 inches by 14½ inches, and, say, ¼ inch thick; 2 pieces for side panels B, C, 23 inches by 3 inches, by ¼ inch; these are for the panels. For the framing of the panels, 2 pieces, D and E, 23 inches by 2½ inches by ½ inch; 2 pieces, G and H, 20 inches by 2½ inches by ½ inch. For chair rail, supposing that it is to be worked as a professional joiner would do it, 1 piece, H, 20 inches by 4 inches by 2 inches; or, supposing it is to be built up as an amateur would in all probability do it, 1 piece, 3½ inches by 1¼ inches by 20 inches; 1 piece, 20 inches by 1½ inches by ¾ inch; 2 pieces, 20 inches by ½ inch by ¼ inch; 1 piece, 20 inches by ½ inch by ½ inch, lettered respectively *a*, *b*, *c*, *d*, *e*, in section and also in elevation. For skirting board, 1 piece, 20 inches by 7½ inches by 1½ inches; 1 piece, 20 inches by 3½ inches by ½ inch; 1 piece, 20 inches by ½ inch by ¼ inch. All these pieces, as it has been said, should be a little larger, wider, and thicker,

in every case to admit of planing down to the dimensions given above; and we will suppose that this has been done, and that all the pieces are now ready for putting together. It will be noticed from the sectional view of the skirting board that it is a composite structure, and that I have said nothing about this in estimating the pieces required. Perhaps it will be as well to give at once the number and sizes of pieces required for building up the skirting board as shown in Fig. 160; but it must be borne in mind that we are now putting together a specimen panel, to become better acquainted with the mode of going to work before starting on a room, and that in this we have no original skirting board to build on and over. If, however, the original skirting board in the room in which we are going to put up a dado was 3½ inches wide by ¾ inch thick, we should require 1 piece 20 inches by 3½ inches by ¾ inches, 1 piece 20 inches by ½ inch by ½ inch, 1 piece 20 inches by ½ inch by ¼ inch, and 1 piece 20 inches by 3½ inches by ½ inch. If any amateur wood worker who makes the specimen panel determines to do so as if he were working on an actual job, he will now know precisely what he requires. Of course, it will be understood that there must be a rough basis of matchboarding or a skeleton framing to represent the wall, and to serve as a foundation, so to speak, to which the parts of the specimen dado may be attached, and that there is no necessity to plane up the backs of the pieces that are to be placed on this foundation.

Foundation for specimen panel.

294. The first thing that must now be done is to prepare the matchboarding- which to my mind is preferable to a skeleton framing, for reasons which will appear directly. These reasons are, that as the position of the parts must be all measured out and indicated on the matchboarding, or on whatever else may be selected as the foundation, it will be easier to do this on a surface that is continuous and practically unbroken, as matchboarding is, except by the beading; and the side that is unbroken by beading may be used with as much, if not more, advantage than the other; and owing to this, the amateur will find the work of fixing far easier than if he resorted to a skeleton framing. Moreover, the lining out on the foundation will form a rough full-sized working drawing, and the home carpenter will find that he will have to do this on the wall and under far less advantageous circumstances, because the walls of a room are vertical, whereas the foundation may be placed before him on the bench or on two stools, while he is engaged in the work of lining out. Let us suppose that this has been done, and that we are now in a position to proceed with

Lining out foundation to receive parts of dado.

fixing the wood work of which our specimen panel is composed, fitting the various parts together as we proceed.

Repairing and fixing parts of specimen panel to foundation.

295. First of all, lay on the foundation the thin material selected to form the panels, and brad them in their respective places with fine ½-inch wire tacks. This will be very quickly done. Then take the pieces lettered A, B, and C, in Fig. 160. Now take the pieces D and E, cut them exactly to the length they should be, and measure off 3 inches on each end of each piece, measuring and marking this distance on the *planed up front* of the slips. I lay emphasis on the word *front*, and I do so because if the amateur is not careful on which side he makes his notches for the halved joints, he will in all probability come to grief. Continue the pencil marks on each side of the slips, which should be exactly ½ inch thick. The marking in pencil will, of course, be done with the square. Now, take a marking gauge, and set it accurately to ¼ inch, and, placing the block of the gauge against the front of the slip, run it round the end and sides or edges, right round from pencil mark to pencil mark. Then with a fine tenon saw cut across the front along the transverse pencil line, keeping the pencil mark intact and unobliterated, until the line traced by the point of the marking gauge is reached. Do this with each end, and then, placing the ends by turn upright in the bench vice, run the saw down the lines traced on the edges by the marking gauge until the transverse cut first made across the front of the board is reached. The piece thus cut away should fall out; but if the saw is not deep enough to reach the transverse saw kerf, and the piece splits off, leaving some slight projecting pieces, clear them away with a sharp paring chisel. Do this with the four ends of the two uprights and lay them aside. Next, take the pieces F and G, and having determined by accurate and careful measurement the position of the notches, which in this case have to be formed at the *back* of the pieces which represent the rails and marked transverse lines with pencil and square across *back and edges*, draw the point of the marking gauge across the partof the slip at which each notch comes, both on the top and bottom edge. Having the *back* uppermost, saw down to the lines marked by the mortise gauge, clear out the wood that still lies in the notch with the paring chisel, reducing the bottom of each notch to an exact level by the aid of a router. When both pieces have been notched, mark the position of the edges of the uprights D and E, and the rails F and G, on the panelling, testing all with the square, and then screw down, first the uprights and then the rails in their places, countersinking the holes to receive the heads of the screws with a small rose bit held in a pad. The panel and its surrounding framing is now complete.

Cutting notches in framing and fixing it.

296. It matters very little whether the skirting board or chair rail be fixed first in the specimen panel; but the course of procedure in fitting up a dado round a room will be skirting board first, panelling second, and chair rail last. Let us then proceed with the skirting board, and let us suppose that it has to be built up, as it doubtless must be, in doing the work in any room. First, at the foot of panel and rail, fix the first of the inner pieces shown in the section of the skirting, or, in other words, the upper piece of the two at the back, and then fix the lower one. Next, cover these over with the front piece K, the top of which will project ½ inch up the rail. If these three pieces had been put on solid in one piece, the top piece would have been bradded on to the upper and outer edge, to save the trouble and labour of rebating. Then, after chamfering the upper outer edge of the lowest member of the skirting board L, or hollowing it as shown in Fig. 159, screw this on, and finally, after taking off the outer edges of the fillet M, so as to bring it into the form of mopstick moulding, fasten it with small brads in the position it has to occupy, and the skirting board is then completed. It may be said that the screwing up of K to the pieces behind will bring the overlapping part at top, hard against the lower edge of the bottom rail, and will keep it firmly in its place.

Fixing skirting board in place.

297. Lastly, the chair rail itself must be finished and fixed to the wall, and in all probability the walls will require plugging, if we were at work on an actual job; but in our case, if the chair rail be built up, the first thing to be done will be to screw on the containing member that holds the upper edge of the top rail in place, and then to draw the inner part of the chair rail, namely *a*, with the containing member *e* tightly to the matchboarding, with screws inserted through the matchboarding from behind, after having taken a little bit off the upper outer arris, so that it may be more easily worked down with sandpaper, to harmonise with the round piece, *b*, which must be attached to the inner piece with either screws or brads. Then the fillet *c* immediately below *b* must be worked and bradded on, and, after this, the semi-circular mopstick moulding *d*, which completes the work.

Fixing chair rail in place.

298. The operation of plugging a wall has been described elsewhere, and nothing further need be said about it. In fixing a chair rail or additional strip, along the top of an existing skirting board, to a brick noggin, or lath and plaster partition, all that need be done is to sound the wall by tapping it gently with a hammer in order to find the studs, to which the pieces may then be nailed or screwed. When a piece of wood, necessary for building up

How to hide heads of screws or nails.

a chair rail or skirting board, such as *b*, in Fig. 160, or even a narrow fillet like the mopstick moulding *d*, is laid over the heads of the screws or nails, as the case may be, nothing further is needed to conceal them; but it may happen that the moulding is worked in the solid throughout, or that a bought moulding, obtained from the manufacturer, is used, in which case the heads of the nails or screws will be open to view. Now, there is an excellent method of hiding the heads of screws and nails other than that of stopping with putty, white lead, or patent filling, and that is by plugging with wood-plug. We will suppose that our chair rail has to be fixed to a brick wall, and that instead of plugging the wall, we take our chance of hitting a joint or of sending the nail into a brick which it will enter, provided always that the brick is not too hard, so hard indeed that it turns the nail in an other direction. Our first care is to make a circular hole, or as many circular holes as may be required in the whole length of the rail with a brace and bit, using a centre bit. The depth of the hole should be about ½ inch or ⅜ inch; but I have purposely exaggerated the depth of the hole in my illustration, in order to make the process as clear as possible. When this has been done, finish the small hole left by the point of the centre bit by boring through the wood with a gimlet or large bradawl, and having got the rail into place drive in the nail. Leave the heads projecting slightly beyond the surface of the wood, and do not attempt to drive them home to the bottom of the hole with the hammer, lest the surface of the wood be bruised or dented in any way, which would spoil the look of the work. Then cut a plug of the same depth as the hole, or a trifle thicker than the hole is deep, as nearly in the shape of a circle as you can, and drive it into the hole, keeping a bit of wood over the plug all the time, and striking the wood and not the face of the plug with the hammer to prevent injury to the chair rail. The grain of the plug should run in the same direction as the grain of the wood, or, in other words, the plug must not show the end grain, as an ordinary peg would when it is driven into wood and cut off. This mode of hiding the head of a screw or nail as shown in elevation and section in Fig.

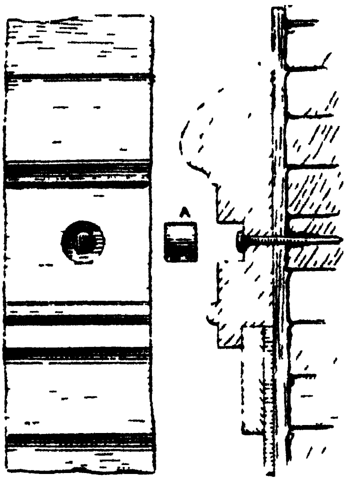


Fig. 161 Mode of Plugging to hide Head of Nail or Screw.

161, is a useful thing to know, and will be found serviceable in many cases. If the head of the plug project beyond the surface of the chair rail when driven home, it must be carefully pared with a chisel, to reduce it to the level of the face of the rail, and finished off by rubbing it with very fine sand-paper, turned over a flat piece of wood. I use myself a triangular block of wood of the shape shown in Fig. 162, for broad flat work and general purposes; but for such a job as that just described, I should use a small flat piece of wood, about 1½ inches long, 1 inch wide and ¾ inch thick —of a size, in short, that can be conveniently held between the thumb and forefinger.

Sand-paperer.

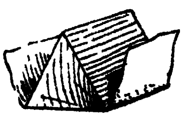


Fig. 162 Sand-paperer.

Treatment of panelling round room.

299. It is one thing to make an ideal panel with chair rail above and skirting board below, as we have been doing, but it is altogether another thing to set out a room all round for a panelled dado; so we must now see how the panelling is to be treated. This, it will be remembered, has to be carried all round the room, except by the fireplace, the door or doors, as the case may be, and the windows if they happen to be low, and which in some instances may be French windows opening down to the ground. The recesses also will have to be considered. It is desirable, therefore, that the amateur wood worker who is bent on panelling the lower part of a room and equipping it with a real wooden dado, and not a sham affair simulated by wall paper, should first make an accurate measurement of it, and prepare a working drawing of each side, showing, perhaps, the door in one, the window or windows in another, and the recesses and fireplace in a third, the fourth being without a break, and presenting a continuous series of panels from corner to corner of the room. It is desirable that the panels—which, as a matter of course, will be all of one height from skirting board to chair rail, 22 inches being an average height, as shown in the construction of our ideal panel in Fig. 160—should be of uniform width, so an endeavour must be made to manage this as nearly as possible, and especially on the unbroken side of the room. It does not matter whether the panels be less in width than the height, or equal in width to the height, in which case they would be square, or greater in width than the height; but it should be sought to make as many panels in a panelled dado as possible of the same width, taking care not to let any discrepancy of width occur in places where such variation would offend the eye. Thus, if there must of necessity be panels less in width than the majority of panels in a room, let them occur, if practicable, in pairs, on each side of a door or window, and so on. It is

Width of panels.

impossible to lay down any hard and fast rule. I can only give general hints, and the home carpenter must then be guided by circumstances.

Spacing out walls for panels.

Treatment of framing at angles of room.

300. Now supposing, for the sake of working the matter out, that the side of the room that has no break in it be 12 or 15 feet in length, then we know that 12 feet or 144 inches is divisible into 9 spaces of 16 inches each, or 8 spaces of 18 inches; and 15 feet or 180 inches is divisible into 12 spaces of 15 inches each, 10 spaces of 18 inches each, and 9 spaces of 20 inches each; and perhaps, having regard to the other sides of the room, the division into spaces of 18 inches might best suit the requirements of the amateur wood worker in either case. If the room were 11 feet 6 inches or 12 feet 9 inches in length along this unbroken side, it would still be desirable to divide it into 8 spaces; but in the former case the spaces would be 17¼ inches in width, and the latter 19⅛ inches. As a general rule it may be laid down that division into spaces must always be regulated in such a manner that uniformity of width may be preserved as far as possible. It is unnecessary, and, moreover, a waste of time and space, to go any further into hypothetical cases, for the regulation of the spacing can only be fairly determined when the measurements of all parts of the room are known. Small panels are always admissible in the sides of recesses and on either side of fireplaces, and variation in size on the sides of doors and windows, as already said; but then panels in such a position should be in pairs of equal size. If recesses are already occupied by dwarf cupboards, or are intended to be so filled, or to be fitted with bookshelves, the dado must not be carried into them; otherwise, if small, they may be filled with a single panel, or, if of good size, with two: or with a larger panel in the centre with smaller ones on each side, equal in width to those on either side of the recess. One thing, however, must be kept in mind, and that is, that the framing of the panels must always meet at the angles of a room, whether the angles be re-entering, as at each corner of a room, as shown at A, or salient angles as at the projecting corners of a chimney breast, as shown at B in Fig. 163. The framing may be mitred as shown by the dotted lines; that is to say, bevelled at the edges at an angle of 45°, or they may be butted against one another. Most amateurs, I am sure, will prefer the latter and easier method. Due allowance must be made for this in the width of the rails. Thus, if the framing be 3 inches wide and ½ inch thick, one of the pieces, it does not matter

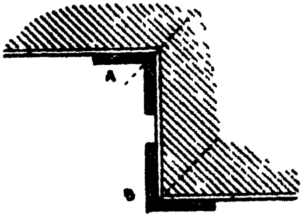


Fig. 163. Treatment of Framing at Corners or Angles of Room.

which, both at A and B, must be 3 inches wide and the other 3½ inches wide. In the diagram the shaded part represents the plastering of the walls, against which is placed the panelling that is held in place by the framing.

301. Let us now work out on paper the process that must be gone through in spacing out a wall to be panelled, taking as our example the unbroken side of a room 12 feet in length, which divides into eight equal spaces of 18 inches each, as already shown. In order to frame eight panels, it is manifest that we must have nine vertical pieces to serve as uprights, styles, or muntins, whichever you may prefer to call them. If we take our framing to be 2½ inches in width and ½ inch in thickness, and assume that the side of the upright at each end is to pass behind the adjacent upright by which the corner is turned, as shown in Fig. 163, it is clear that the wall space taken up by the uprights will be (2½" × 9) + (½" × 2) = 22½" + 1" = 23½ inches. I am under the impression that I have already explained that (') attached to a figure indicates that the numeral represents feet, and (") means inches; but if I have not done so I rectify the omission now At all events, in making any little calculation such as above, it is better to write it briefly thus, than to draw it out by repeating the word "inches" four times. The length of the side of the room being 12 feet, this will be 144 inches, and deducting the space to be occupied by the framing, namely, 23½ inches, we get 144" - 23½" - 120½ inches; and this result divided by 8, the number of spaces, gives 15$\frac{1}{16}$ inches, as the width of each panel, which practically we may regard as 15 inches full; for in measuring spaces along a wall, if we are not very careful indeed, half an inch is soon gained and soon lost by a trifling inaccuracy in the pencilling; so if we go just beyond the 15 inches in marking out the wall, or the slip of the same length as the wall on which we must first mark them, we shall not be far wrong. Moreover, to be exact, we might make the uprights at each end 3¼ inches instead of 3 inches, which would leave the width of that part of the upright which was exposed to view, 2¾ inches, instead of 2½.

Setting out rail for dividing wall space into panels, etc.

Determining width of panels.

302. Without doubt this minuteness of description will appear tedious and unnecessary to many a reader; but it must be borne in mind that I am writing for as many, and probably more, who have never done anything of this kind before; and many of my correspondents, both at home and abroad, have frequently told me that it was entirely owing to this minuteness of detail both in *Every Man His Own Mechanic*, and *Amateur Work*, that their success as amateur workmen has been assured and

Touching minuteness of detail.

achieved. It seems to me, therefore, that I cannot do better than continue in the course I have pursued from the very first, in dealing with matters of this kind; for it is through lack of this that the writings of many professional workmen who write for professionals to whom these matters are only the A B C of carpentry and joinery, fail to be useful to the fullest extent to amateurs. And now I am in an apologetic groove, I may as well say something in defence of the bold and prominent chair rail shown in Fig. 160 I said that chair rails subdued in prominence were desirable when the walls between them and the skirting boards below were merely papered or worked in Gypsoline, but circumstances are altered by having panelling between chair rail and skirting board; and the introduction of a bold chair rail above panelling is in entire keeping with the wood work, and produces a result that is neither out of the way in character, nor offensive to the eye. What is undesirable under circumstances of one kind becomes desirable under circumstances of another kind; and this is a case in point.

Bold chair rail when admissible.

303. I have said that it is needful to mark out the division of the wall into upright and intervening panels on a slip of wood the length of the room: and we will presume that this has been done. And now come two nice points in the whole proceeding, about which we shall have to be very careful. Most amateur workmen will now think that we have only to measure the height of the top of the chair rail above the floor at each corner of the room, and to draw a straight line from one point that has been thus determined to the other, and go to work at once to line out the wall with horizontal and perpendicular lines, showing positions of chair rail, panels, and skirting board. With *horizontal* and *perpendicular* lines certainly! but how are we to know that transverse lines drawn along the wall from points thus gained, and lines up and down the wall, by transferring the marks on the slip already marked out to show uprights and panels, will be truly horizontal and truly perpendicular? No; there is something more to be done before we can be sure on these points. Firstly, the floor itself, from one cause or another, may not be level; and so the whole work would, or might be, all askew when finished. Now, if the floor be out of level, the upper edge of the existing skirting board on which we are about to place another piece will be out of level too, unless the floor has sunk on one side without carrying the skirting board with it; and our first duty is to test the top of the skirting board with the level. If the unerring testimony of the level tells us that the skirting board is all right, we

Lining out the wall itself

Testing level of skirting board.

can go on without fear as far as all transverse lines are concerned; for if the top of the skirting board be truly level, all lines drawn parallel to it will be level too. If, however, the top of the skirting board is not level, if we are going to increase its existing height by placing a piece at the top, we must work this piece in such a way by reducing its width at one end or the other so that its upper edge is brought absolutely on a level. This done, we may make our measurements upwards for top and bottom of chair rail and position of rails of framing, and we may rest assured that being parallel to the skirting board they will be horizontal.

Determining vertical lines.

304. But there is yet another nice point to be taken into consideration. I have said there were two, and, as yet, we have only dealt with one of them. Suppose that the plastering of the wall is not altogether vertical, and we must not take it for granted that it is so, if we apply our slip to the wall just above the skirting board and transfer the marking, and then do the same to the wall just under or above the chair rail, and draw by aid of a straight edge straight lines up and down the wall, from the points thus obtained we may find that, although these lines may be parallel, they may not be truly vertical. Our best and only course now is to mark out our spaces from the slip under the space marked out for the chair rail, and then to determine with the aid of a plumb level placed against any point already marked. It does not matter what point you take among those marked below or above, as the case may be, the level of the chair rail; but having marked a truly vertical line from the point selected by means of the plumb level, select the corresponding point on the slip; and then putting point on slip to point on plumb level, mark your points to right and left of it to each corner of the wall. Then rule all your horizontal and vertical lines on the wall itself with pencil and straight edge; and you will find, when your work of panelling is completed, that if it has been done in a workmanlike manner, as it should be, all will be truly fair and square. All things mundane, it is said, must have an end; and, in accordance with this general law, here endeth the present lesson.

305. I have said nothing, as yet, about the ornamentation of panelling. Many possibly may consider it, as I have described it, best as it is, being as—

Beauty, when unadorned, adorned the most.

Ornamentation of panelling.

Others, like beauties in general,—who seem to think that nature-given charms are enhanced by "rings on their fingers," and all kinds of jewellery, from brooches to bangles and bracelets, from tiaras to anklets—for they would go in for these with short dresses to show them if any princess or duchess would lead the way, like a pioneer sheep over a hedge—anything of this sort, perhaps, except "bells on the toes," unless they came in in conjunction with toed hose,—may like a little enrichment to their panelling; and to these I may suggest moulding within the framing of the panel, or my favourite stop chamfering on the arrises that surround the panel, or a simple bead or amplification of the bead, by reeding round the edges of the framing. They must remember, however, that panelling in churches and in old houses was more frequently treated as I have described it; although in many places built in the far-away and ever-receding long ago, panelling was bold and massive to a degree, as was the case in my old rooms that lay at the foot of the staircase that gave access to the Combination room, at Christ's College, Cambridge, where the dons were wont to assemble after hall, to sip their port, that you may be sure was good, and to crack their nuts—and jokes. And here I cannot resist the temptation—especially as there will be, as there have been, many university men among my readers, of perpetuating and embalming a telling epigrammatic joke, that was cracked on—may I say?—both the head and shins of a college tutor, surnamed Sheepshanks, who, I believe, subsequently became a venerable archdeacon. He had announced, in a notice stuck up duly in hall, his intention of lecturing on the "Satyrs" (*sic*) of Horace; whereupon an undergraduate of his college, who was possessed in his generation of a far larger allowance of wit than wisdom, penned exhibited the following quatrain:—

> The satyrs of old were satyrs of note,
> With the head of a man and the shanks of a goat;
> But this Satyr of ours, all satyrs surpasses,
> Whose Shanks are a Sheep's, but whose head is an ass's.

The good archdeacon has long since gone to his rest, otherwise I would follow the advice contained in a Latin sentence, that an old college servant—whether Oxford scout or Cambridge gyp, I really forget—who when speaking of the results of the sowing of wild oats by some of those who had then gone over to the great majority, was accustomed to close his narrative by saying, "Well, gentlemen, well, so it was; but '*De mortuis nil*—say nothing ill—*nisi bonum*—of the dead'!" which, taken verbally, is one of the freest of free translations I have ever met with.

306. But this, my readers will pertinently remark, has nothing to do with dadoes, and I can only bow my head to the impeachment, and forthwith take up once more the thread of the subject in hand, pleading as my

the practical advice of Æsop, who showed by force of example that a bow that was always kept bent soon became useless, and that "all work and no play makes Jack a dull boy," even though he be that versatile being known colloquially as "Jack of all Trades". Returning to the consideration of dadoes, I think I have said everything that need be said, and, indeed, that can be said, on the general principles involved in, and bearing on, the construction of dadoes. I have, however, illustrated these principles by the description of one form only, namely, the quadrilateral or rectangular form; but there are other forms which the panelling of dadoes may assume, and which can easily be rendered by means of the system of mocking, and the alteration of the framing of the panels to suit the form desired. The forms other than quadrilateral must be, as a matter of course, rectangular or curved; and to produce the latter, we must have recourse to the arcs of circles and ellipses. So many different patterns occur to my mind that I could fill several pages in illustrating them and describing their construction. In fact, there is no end—no limit—to things of this kind. I must, however, confine myself here to the exhibition of four regular rectilinear forms, and as many curved forms. Hints and suggestions for others will emanate from constructive work described elsewhere in Parts II. and III. of this volume; but it must be sufficient to point these out as I come to them.

Other forms of panelling for dadoes.

307. The four regular rectilinear forms to which I am alluding are the equilateral triangle, the lozenge, the hexagon, and the octagon; and beyond this shape it would be both needless and useless to go. I will deal with these to the extent necessary, first of all, leaving any further mention of the curved forms until these are done with. These rectilinear forms and the different points of construction involved in preparing them and putting them together are shown in Figs. 164, 165, 166, 167. It will be better, however, to say a few words on each form to explain any apparent difficulty in point of construction—of actual difficulty there is really none, as every amateur wood worker would readily allow when he has made, as I have, several panels of Japanese or Japanesque trellis, consisting of small lengths of wood of equal width and thickness, halved together at the various points of junction and held together by small screws; and fragile as the attachment may seem, I have never found any trellis work thus made to be less enduring or more liable to injury than ordinary trellis: although the latter, from its form and prolongation of the slips of which it is formed, from one part of the framing to another is, and must be, stronger. To go into other varieties of rectilinear trellis in addition to those mentioned above, and about which I am

Rectangular forms of framing.

now going to say something more, is not possible on account of space; so I will content myself by reminding the reader of the old Greek pattern, familiarly known to us as "key pattern," which may easily be adapted and pressed into the service as an ornamental framing for panelling by the home carpenter.

Panelling in form of triangle.

308. In Fig. 164, I have given an example of framing, so fashioned as to exhibit the panelling in the form of equilateral triangles, of all triangles the most regular and most symmetrical in shape. In this, as in Figs. 165, 166, and 167, the top and bottom rail of the framing is shown in order to exhibit the manner in which the halved joint is effected at the apex of the triangles, or at the points of meeting of the slips of which the framing is composed. The notching at the *back* of the rails is taken out in the form of a truncated equilateral triangle, that is to say, of an equilateral triangle shorn of its apex. To secure a good fit and a close joint at the meeting of the slips, each end should be kept in a complete form until the
Sl, ips are halved in front, and ready to be dropped into the notch in the rail.
Whei
slip sh en I say "complete form," I mean that the notched or halved ends of each
straight ould have the whole of its outer edge parallel to, and equal to the
slip has bee line in which the saw cut is made to take out the notch. When one
the vertical do n dropped into place, square off the projecting corner, as shown by

Ornamental additions and insertions.

rule and ted line; then lay the next bar on top of it, and, having with
mediately over the ed e a pencil mark on the projecting corner im-
squared off, cut it off full, and there, where the end of the slip below has been
spring them both into place together, and slightly lifting the end of the other,
accurate joint is the result In the three it will be found that a close, tight, and
in Fig. 164, I have suggested means wherecomplete triangular panels shown
framing, various ornamental forms may be obtained by small additions to the
of the pieces, curved slightly at the sides—one in the ce us in A, the addition
the triangle, the semblance of a trefoil may be exhibit ntre of each side of
introduction of the three curved slips whose edges for ted. At B, by the
perfect circle may be got in the centre of the panel, with m arcs of circles, a
points beyond; and at C ornamental forms are produced three corresponding
triangle, although curved lines predominate in their for whose basis is the
be made the means of using up small pieces of fret wood in nation. This may
and introducing variety of colour, as the centre of the en work of this kind,
of light wood, and the other parts of dark wood, or *vice ver* tire panel may be
309. Passing on to Fig. 165, this exhibits an attracti *sa.*
form of panelling, consisting of squares placed lozenge-wise e and symmetrical
with intermediate

EXAMPLES OF VARIOUS KINDS OF RECTANGULAR PANELLING.

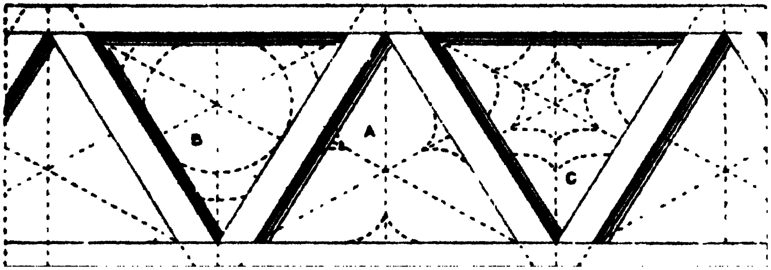


Fig. 164. Panelling in Form of Equilateral Triangles.

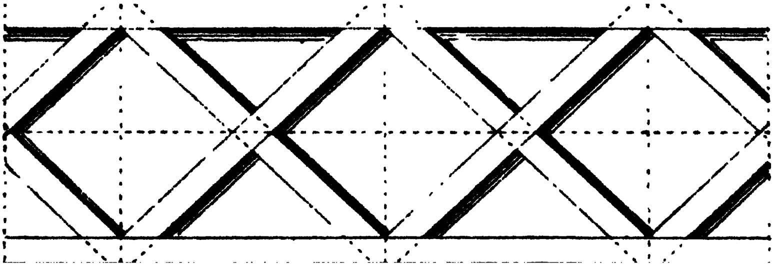


Fig. 165. Panelling in Squares and semi-Squares placed Lozenge-wise.

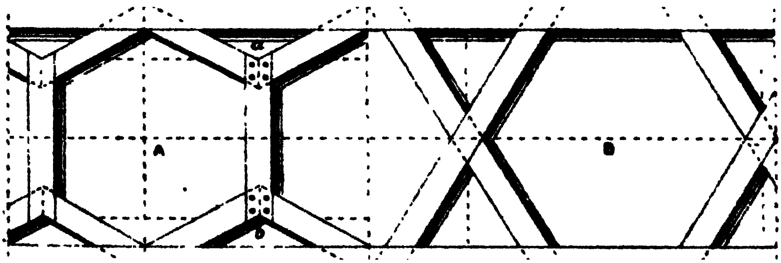


Fig. 166. Two Forms of Hectagonal Panelling, Upright (A) and on Side (B).

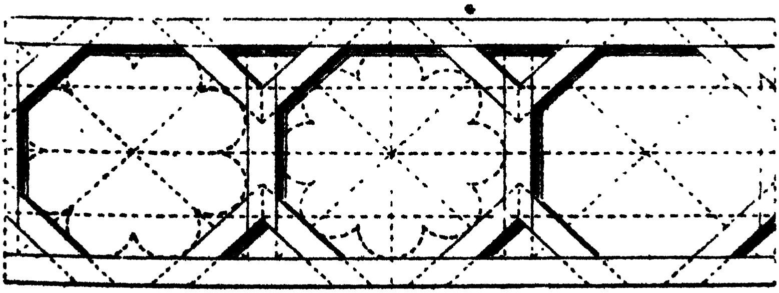


Fig. 167. Octagonal Panelling in the only Form it can assume.

Panelling in squares and semi-squares.

semi-squares, whose bases are formed by the top and bottom rail. There is nothing much to be said about this formation, as it presents no difficulty whatever. The crossed slips are halved together at right angles to each other, and the ends are notched into the top and bottom rails at angles of 45°; whereas, in the case of the equilateral triangles in Fig. 164, the slips entered the top and bottom rails at angles of 60°. The mode of cutting and springing in the ends of the slips in the notches cut in the top and bottom rails holds good here, and in all other compound halved joints of the kind, where two pieces enter one notch, as in the junction of ends of slips in Fig. 164. I must not omit to say that the wood worker may vary the form shown as a square placed lozenge-wise in Fig. 165, by lengthening the transverse diagonal of the square, and giving it a rhomboidal form, as shown in Fig. 168; and as a matter of course the same may be done in Fig. 164 by varying the inclination of the slips, so that, although the triangles are still isosceles, or have two sides equal, they are no longer equilateral.

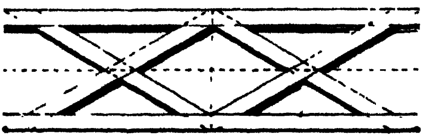


Fig. 168. Elongated Variation of Form, shown in Fig. 165.

Hexagonal panelling.

310. In Fig. 166 two forms of hexagonal panelling are shown, in one of which, A, the hexagon is in an upright position, but in the other, B, it is on its side. In the first case the divisional construction by which the form of the hexagons is obtained, consists of five pieces of wood, one upright central piece with two divergent arms at the upper end, and the same at the lower, joined to it at angles of 120°. The ends of the divergent arms enter the top and bottom rails in notches whose sides are inclined to one another at the same angle. The only difficulty in this form rests in the slightness of the connection at the halved joint at *a* and *b*, but the joint may be strengthened by making it a glued joint, and further securing it by the insertion of two small ½-inch screws inserted from behind in the position indicated. It must be understood that the vertical slip in the top and bottom of which the divergent arms meet and join, is notched and halved at the *back*, to receive the ends which are notched from the front. In the other form, B, there is no difficulty whatever, as the division between the hexagonal spaces is effected by two slips put together X *fashion*, each slip being precisely the same in form, and having the same inclination, as opposite sides of the equilateral triangles shown in Fig. 164. They are halved together at the centre, and are so inclined together that the angles at the top and bottom fronting the top and bottom rails are angles of 60°, and the larger angles at the sides, angles of 120°.

311. The octagonal form of panelling is now the only one that remains to be considered. In this, the divisional construction that forms the octagon is made in precisely the same way as that which forms the hexagonal panelling shown at A in Fig. 166, that is to say, by means of arms divergent at top and bottom from a vertical piece into which the ends are halved in precisely the same manner. They diverge from the central piece at an angle of 45° on the upper side, and enter the top and bottom rails in notches, halved from the back, and also at angles of 45°. I have purposely said nothing about the complementary angles of divergence at 135° on the other side between upright and arms. The means of imparting a floral form to the panels are indicated by dotted lines, representing the insertion of small curved points at the sides of the hectagon in one case, and at the angles in the other. We have now finished with regard to rectilinear forms of panelling.

Octagonal forms of panelling.

312. Curvilinear forms of framing may be cited well-nigh in any number; but I will content myself with mentioning just four kinds, referring incidentally to others in describing these. In Fig. 169, I have grouped together four kinds of arcaded panelling, and in each of these it is better perhaps that the heads of the panels should form an extension of the top rail of the framing, reaching, according to the drawing, as far down as one-fourth the width of the space between the top and bottom rail, where it is met by the upright which meets the bottom rail and is notched into it. By taking a radius equal to the extension of the rail, a circular heading is traced, which must be cut out with a key-hole saw or a compass saw, it does not matter which. This gives the form of an arcaded panelling with circular heads, as shown at A. By extending the bottom rail upwards to the same extent that the top rail has been carried downwards, we get a series of narrow panels with circular heads, which may easily be extended to show an upright elliptic form, by working arcs on each side. When I say "an upright elliptic form," I mean an ellipse in which the major axis assumes a vertical instead of a horizontal position. In B an example of arcaded work is shown similar to the first in general principles, but differing from it in having double the space between the semi-circular heads of the arches, so that when the upright slip is inserted between the top and bottom rails, a shoulder is left between the vertical piece and the arch. The semi-circular arch is found in old buildings of Saxon and Norman architecture, and a very beautiful form it is. At C an example of the pointed arch, a leading feature in Gothic architecture, is shown. Only half the heading is given, in order

Curvilinear forms of framing: arcaded panels.

EXAMPLES OF VARIOUS KINDS OF CURVILINEAR PANELLING.

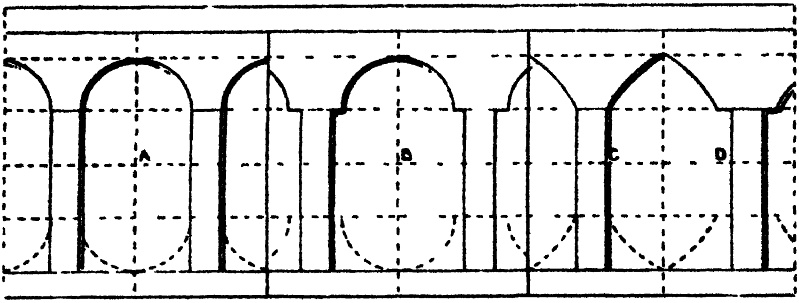


FIG 169 Four Examples of Arcaded Panels, with Saxon and Gothic Heads

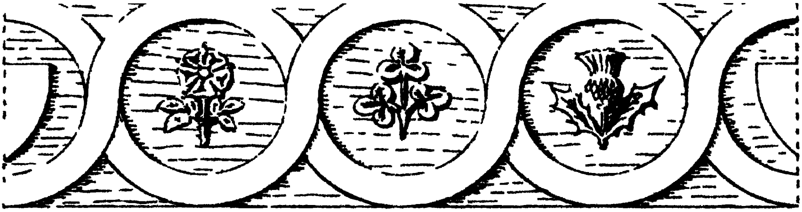


FIG 170 Panelling in Form of 'Guilloche' Work, with Carved Emblems

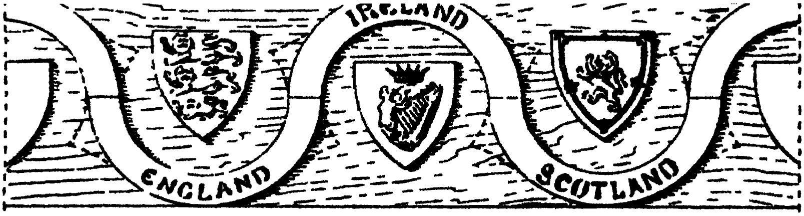


FIG 171 Panelling in Serpentine Form, enriched with Armorial Bearings

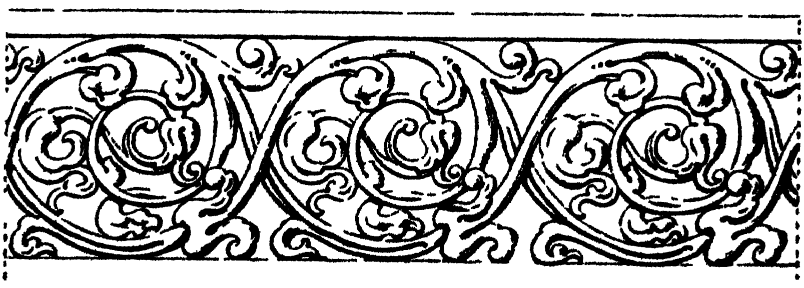


FIG 172. Panelling in Form of Bold Fret Work, enriched with Carving.

to save space; but the amateur wood worker can easily extend this for himself in working drawings on a larger scale, and, moreover, drawn to scale, which is not the case with any of the diagrams from Fig. 164 to Fig. 172 inclusive. At D half of the Gothic heading is shown with a shoulder, as was done with the Norman heading at B. As in A the dotted arcs above the bottom rail in B, C, and D show how these panels may be rendered with semi-circular and pointed ends at the bottom as well as at the top.

Norman and Gothic heading.

313. In Fig. 170 a circular panelling is shown, which is so rendered as to assume that peculiar form of ornament which is termed the "guilloche" pattern. It has the semblance of two bands, passing over and under each other in alternation. The under band, wherever the bands cut each other, should be just lightly cut away with the chisel, so as to give a better idea of the upper band being in higher relief. The joints in the slips of which the ornament is fashioned, may be in the central transverse line of the space between the rails, in which lay all the centres from which the arcs are struck, and in the vertical lines through the centres of the concentric circles. By adopting this mode of cutting out the slips, much waste in wood will be avoided. The arcs of which the ornament is composed are independent of the top and bottom rails, and merely touch them; in the centre of each circular panel may be placed an emblem or ornament, cut out with a fret saw and carved in low relief. In Fig. 170, rose, shamrock, and thistle, the emblems of England, Ireland, and Scotland, have been introduced as examples of this kind of treatment.

Panelling in form of guilloche ornament.

314. In Fig. 171, a pretty kind of panelling is shown by framing of a serpentine form, produced by arcs of quarter circles, or, rather, quarter or quadrantal arcs of circles, joined in the horizontal line midway between the rails and vertical lines through the centres of the circles. The bands may be enriched by the addition of points, added after the arcs have been placed in position, or in the solid, with the arcs themselves, so as to save the trouble of fitting their inner edges to a curved line, which, to say the least of it, is a troublesome procedure. Then in the intervals, shields are placed in the manner indicated, one line being mostly above and the other mostly below the central line, there being equal distances between the top rail and the top of the higher shields, and the bottom of these higher shields, and the upper edge of the band. The same rule is observed in assigning their position to the lower shields. On the shields in the example, the simple armorial bearings of England, Ireland, and Scotland are shown, and above

Serpentine form of framing.

and below them, as the case may require, the names of the parts of the United Kingdom to which they belong are incised on the band. Those who possess or use armorial bearings may show with advantage their own heraldic insignia, and those of the families to which they are closely akin, or with which they are closely connected, with the name or motto of each on the band.

Use of heraldic insignia in ornamentation.

Those who do not may introduce the arms of their university and college if they are university men, or the armorial bearings of the county, and corporate towns of the county in which they live, and the diocese in which their dwelling finds a place. It affords an excellent opportunity for introducing colour and gilding into framed panelling, which should not be lost sight of. The introduction of emblems and coats of arms may be resorted to in rectilinear panelling; but owing to the rigidity of form which rectilinear panelling assumes, it does not lend itself so readily to this sort of thing as the softer lines of curved framings.

Elliptic framing.

315. I must not omit to say that the circular guilloche framing shown in Fig. 170 and the circular serpentine form exhibited in Fig. 171 may be so extended laterally as to present a succession of ellipses, instead of circles in the former and a more extended sweep in the latter, although I do not think any improvement will be effected by the adoption of this mode of treatment. I do not give any diagram because the general principle has been shown in Fig. 168; and by this time the home carpenter, if he has gone to work in earnest, and has produced working drawings to scale in circular and elliptic work, must be sufficiently well versed in the latter to be able to carry this out for himself, if he be so inclined.

Panelled dado on staircase.

316. Should the home carpenter resolve on ornamenting his staircase either wholly or in part with a panelled dado, the best form to adopt for the panels will be one of the arcaded shapes shown in Fig. 169. And here I should advise that each separate stair be surmounted by a complete panel. The skirting board already in position will have its top in a slanting line from top to bottom of the flight, and the amateur wood worker may either utilise this skirting as the bottom rail of his panelling or place a piece of stringing to serve as such on the top of the skirting, notching the stringing in a series of steps, if he wishes his panels to finish off in a square form at the bottom. I should, however, recommend him to be content with the original skirting as the bottom rail, if not too massive, in which case he must place a thinner member of the thickness of the material used for the framing of the panelling on the top. From this should spring the vertical pieces used to divide the panels. Each vertical piece should have its rise

from the outer edge of the actual tread, excluding the nosing, so that this outer edge may be in the same straight line with the surface of the riser of the stair below it. The bottom of the panel will be sloping in a direction parallel to the slope of the original skirting, and will terminate in an obtuse angle on the inner side, and in an acute angle on the outer side. The vertical slips will rise to meet the arcaded top rail, and the upper edge of this being parallel to the sloping lines of the original skirting and the strip that has been placed on it, if necessary, the tops or arches at the tops of the panels, whether Norman or Gothic in form, will be in an ascending series, each one rising above the one that is immediately below it from the bottom of the staircase upwards. The top rail will be surmounted and finished as a matter of course by a chair rail, or a member occupying the position of a chair rail; but as it serves no other purpose than that of affording a suitable finish to the work, there will be no occasion to make it too massive, or too heavy in character.

Arrangement of vertical pieces.

317. And now I think I have brought under the notice of the home carpenter every conceivable kind, form, and variety of dado that he can wish for; and he and I—I certainly—will turn with pleasure to another part of my wide subject, on which, after all, I have not said and shall not have said, when I come to the end of the volume, any thing approaching what I could say and what I should like to say. But folio volumes, such as the old divines rejoiced to write, are in favour no longer; so I must perforce hold my hand. I will conclude this chapter with a reminder to the reader of the existence of Gypsoline, and a recommendation to use it for his walls above his dadoes. It is very easy to put on, the only vehicle with which it is mixed being boiling water. It never needs washing off, like limewash, before a new coat can be applied. It is supplied in a variety of pretty tints, and is so cheap in itself that when a tint has been put on, you can quickly change it for another if you do not like it, and as quickly and easily change the colour of the walls if you get tired of that with which you have first tinted them.

Remarks on the finish of the walls of rooms, etc

CHAPTER IX.

SUPPLEMENTARY CUPBOARDS OF VARIOUS KINDS IN HOUSES.

Cupboards in Houses Old and New—Cupboards where Found and where not Found—Cupboards that the Home Carpenter may make—Purposes and Uses to which Cupboards are usually put—Construction of Dwarf Cupboards—The "Fixture" Question: Screws *versus* Nails—Heights of Dwarf Cupboard—Plan of Recess and Topmost Shelf—Dimensions of Topmost Shelf—Cutting Shelf to fit Recess—Actual Work of Fitting Shelf—Errors in Width caused by Plastering—Levelling along Wall for Top of Shelf—Nailing on the Ledges—Scribing Ends and Back of Shelf—"Scribing," What it is—Skirting—Frames for Cupboard Doors—Provision for Fixing Frame—Middle Shelf of Cupboard—Doors of Cupboard—Junction of Doors—Attachment of Doors to Frame by Hinges—Fitting Parts of Cupboard together—Fixing Middle Shelf: Skew-Screwing—Fixing Frame and Top Shelf—Materials, etc.—Casing on Top Shelf—Treatment of Recess above Cupboard—Bookshelves above Recess—Cupboards for Recesses in Bedrooms: their Type—Addition to Skirting Board—Basis or Foundation for Cupboard—Bedroom Cupboard not as Fixture—Caution to Home Carpenter—Good Place for Boots and Shoes—Construction of Carcase of Cupboard and Side Pieces—Transverse Shelves—Nailing Parts of Carcase together—Grooving for Shelves—Back to Cupboard—Matchboarding: its Construction—How to put on Back—Construction of Drawer—Proportions—Mocking of Drawer—Knobs, Handles—Wheel and Rail for Drawer—Door of Upper Compartment—How to make Frame of Door—Construction of Cupboard Doors—Mocking of Cupboard Doors—Dimensions of Mirrors—Filling Circular Panel—Beading of Circular Work—Hanging Doors—Construction of Attic Chambers—The Attic Proper—Length or Height—Change of Aspect how caused—Mode of making Partition and Panelling to form Cupboard in Attic—Framework for Doors—Doors in Framing—Alternative Mode of making Framing in Attic—Shutters, etc.—Panels at Ends—The Bevel, How to make it.

Cupboards in houses old and new

318. We have now well nigh come to the end of the long catalogue of those things which may be done at home by any amateur wood worker in order to render his dwelling more convenient for its inmates, and more pleasing to the eye, and cupboards of a supplementary character seem to be the only things that call for special mention and special treatment. The presence of plenty of cupboards in old houses, and the almost entire absence of them in new houses, may be said to constitute an essential point of difference between the old houses of past times, which, as a general rule, were well built, and abounded with nooks and corners that lent themselves most suggestively and appropriately to cupboard construction, and the new houses of modern times, which, as a rule equally general, are not well built, and seldom have anything more promising than a shallow recess

for utilisation as a cupboard. Look, for example, at the depth of the chimney breasts in many an old house, which present recesses so wide and deep that they can be transformed, and, of a truth, were transformed in many cases, into commodious and convenient closets, large enough in some cases to afford standing room for persons numbering from half a dozen to a dozen, if they were desirous of testing its capacity. But in the scanty recesses of modern houses, you may scarcely find room enough for three persons side by side, and of these every one of them must assume the proportions of Slender, for a Falstaff would be more than twice too thick from front to back

Cupboards where found, and where not found.

319. But most of us have to deal with new rather than with old houses, and after all, the manner of closing in any part or portion of a room to form a cupboard is much the same in all cases; so we will, first of all, pause to consider in what parts of modern houses cupboards will and will not be found as a rule; secondly, to see what kinds of cupboards there are that the home carpenter may make; and, thirdly, to what uses he may put cupboards that he may construct in his dwelling, or better, perhaps, for what uses and purposes he may be called on to prepare them. Before entering on this, however, it will be as well to remind the reader that enough has been said about cupboards in basements and cellars, cupboards to serve the purpose of cellars, and cupboards under staircases: so these, and the places that they occupy, may be dismissed altogether from our consideration. These cupboards and the places that they occupy are *outside* the rooms of a house, so we at once establish this important point, that it is only with cupboards in the interior of rooms that we have to deal. If any part of a modern house is furnished with cupboards it will be the kitchen; and here they will assume the form of double cupboards, separated from one another by the wide shelf that forms the top of the lower and the bottom of the upper cupboard. They are generally placed on each side of the kitchen range, which projects further into a room than the ordinary fire-grate, and whose chimney breast is therefore deeper, and affords more room for commodious cupboards. The lower cupboards are generally put to baser uses, as the householder and housekeeper—or shall I say mistress?—very well know; the upper ones being devoted to the reception of the breakfast and tea service, and many other things essential to the equipment of the table at meal times, for which neither room nor resting-place can be found elsewhere. In the way, then, of cupboards in the kitchen, there will be little or nothing to do; but it is as likely as not that sitting-rooms and bedrooms

a scale of ¾ inch to 1 foot for those parts that do not require such clearness of detail, and 1½ inches to 1 foot for those that do; so we will first make a plan of the recess, or a section of it, in the plane of the upper surface of the shelf, it does not matter which, and explain the construction of the shelf and the mode of fixing it first of all. Let, then, A B C D, in Fig. 173, represent this plane, and D E a continuation of the plane or section of the wall of the chimney breast Plan of recess and topmost shelf. towards the left-hand jamb of the mantelpiece. Now, as the shelf or slab under which the cupboard is to be made, has to fit accurately into the recess, or as accurately as the plastering will permit, F B C D H G will represent the plan of the shelf at the top of cupboard. To carry the shelf, two ledges, K and L, must be nailed to the wall; but these need not be as long as the depth of the recess, which we assumed to be 14 inches. I will say more about the ledges presently, but just now I must confine my attention to the shelf. This, as my readers will notice, is supposed to project 1½ inches beyond the dotted line A D, which represents the extent of the recess taken from the back, to its limit in front, which is defined by a line carried straight across, in continuation of E D, to the side of the room of which a portion is represented by A B. The shelf we will suppose to be 1 inch in thickness, and at first it must be made longer and wider than the space into which it has to fit. For example, B C and A D each represent a length of 36 inches, and this ultimately will be the length of the shelf itself, between the sides of the recess: but it is customary to let the corner of the shelf, shown at G, D, H, project beyond its length for about 1½ inches or even 2 inches, and butt against the wall D E, so the shelf must be 37½ inches in Dimensions of topmost shelf. length in front. In addition to this, another inch or more must be allowed, when the boards—two pieces—of which the shelf must of necessity be composed, are jointed together and glued up so that at first the shelf, in the rough, should be 39 inches by 16 inches by 1 inch.

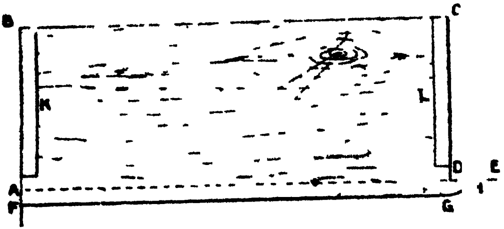


FIG. 173. Plan of Recess and Topmost Slab on Shelf of Dwarf Cupboard.

323. Now, it is possible that the inexperienced amateur may ask: "Why this extra length and breadth; why not cut the shelf to the actual length Cutting shelf to fit recess. and breadth at first, and have done with it?" To this my reply must be that it is long odds against the walls of the room being square with one another, and equally uncertain that the surface of the

wall is so true that when a straight edge is applied to them no inequalities would be revealed. Plasterers, always excepting those in the employ of such men as "Poor Old Uncle" and Mr. Gerribilder, do their best to turn out their work fair and square and in a workmanlike manner; but even as "accidents will happen in the best regulated families," so irregularities in plastering will often appear in work that is or ought to be done in the most conscientious manner imaginable. When the shelf is ready for fitting into its place, measure with accuracy the length of B C along the wall, and, also, by aid of a slip of wood held against the face of the wall at D E, the distance between A and D. If A D and B C are equal, it is very nearly a matter of certainty that the faces of the walls at A B and C D are parallel. The front edge of the shelf F G should be planed up and rendered true throughout. At 2 inches from the right-hand side of the shelf, make a pencil mark, and with pencil and square draw from this mark, which should be made on the front edge, a straight line equivalent to C D. Now, take a bevel I will show you presently how you may make one of these— and apply the stock to the wall along C B at the corner C, and press the blade against the wall at C D. Transfer the bevel to the wood, bringing it to the point C, already found on the inner edge of the slab. If the edge of the blade corresponds with the line already marked at right angles to the front edge F G, by aid of the square, it is a sufficient proof that the wall B C and the chimney breast C D are at right angles to each other, and the part C, D, H may be cut away with a tenon saw. The same test may then be applied to the wall at B A, after the distance F G, which is, or should be, equal to A D, has been measured along the front edge, and a line equivalent to A B determined and marked by aid of the square. If it be established that A B is at right angles to B C, the other end of the shelf may be cut off and the shelf dropped into its place.

324. Now, this is all very well in theory, but unfortunately in practice and actual work it is found to be very different. Let us see what the actual state of the case will in all probability be; and for this we had better have another diagram, similar to Fig. 173, using the same letters *when it is possible to do so*. To begin, let us denote the shelf as it is before cutting, namely, 39 inches long and 16 inches wide, by the letters P Q R S. The depth of the recess was assumed to be 14 inches, and it was to project 1½ inches beyond the line A D in Fig. 173, which is also repeated by A D in Fig. 174. The sides of the recess as set out in Fig. 173 are shown in Fig. 174 by the dotted lines A B, C D. Now, it is probable, and we will take it as

Actual work of fitting shelf.

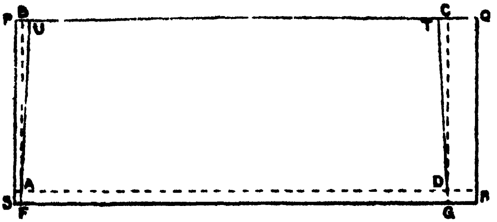


FIG. 174. Diagram showing Actual Work of Cutting Shelf.

Errors in width caused by plastering.

granted that it is so, that the actual length of the opening of the recess along A D is actually 36 inches, and that this will be the length of the front of the shelf, neglecting the small projecting piece beyond D G. On measuring B C at the back of the recess, its length is found to be 35 inches, as much as 1 inch having been lost in the aggregate by the imperceptible and gradual thickening of the plastering from A towards the corner B, and from the arris of plastering at D towards C. We trace, by means of square and pencil, as before, the lines A B, D C, at right angles to the front edge F G, which has been planed and trued up for this purpose; and then apply the bevel to the wall at C, after planing up the edge B C, and bringing it exactly parallel to F G. We find that when the bevel is applied to B C, that when the edge of the blade near the end is brought against the point D, that the edge nearest the stock touches or cuts the edge P Q at T, at a distance of $\frac{5}{8}$ inch from C, which shows us that the right-hand end of the board has to be cut in a slanting direction from T to D, as shown by the line T D. We now measure off 35 inches, the length of the recess at the back towards B, and mark this by the point U. Applying the test of square and bevel, as already done on the other side, we find that a gain in thickness of the plastering to the extent of $\frac{3}{4}$ inch has been made towards the angle B of the recess, just as a gain of $\frac{5}{8}$ inch had been made on the other side, which just accounts for the difference of 1 inch in the width of the recess at front and at back. So we draw the line U A, extending it through A until it cuts the front F G. Thus we find that F A U T D is the actual shape of the recess and the shelf as well.

Levelling along wall for top of shelf.

325. "Well, then," the amateur wood worker will observe, "I have now only to cut the ends of the shelf along the straight lines U A, T D, and it is finished and ready to drop into its place." But I must check his ardour, and ask him to apply slips that have straight edges duly planed and trued up to the back of the recess and the walls at the sides, and he will find that the surfaces of the walls in all probability wind—that there are slight depressions here and there along the wall from B to C, and that there is a decided hollow in the centre of C D or T D, and that the wall from A to B is not perfectly straight. And there is something to be done yet before the

ends and the back of the shelf are cut. At D measure upwards from the floor to the height of 36 inches, the height at which the top surface of the shelf is to be placed, and then with a level draw a line on the wall from D to T. In this manner trace a level line in continuation of that traced from D to T along the wall to U, and then turning the corner proceed in the same manner from U to A. The level must be traced from one initial point, namely, from D or from A. It is useless to measure 36 inches upwards from the floor to A and D, and then level inwards along the walls to U and T, and then join these points; because the floor may not be level, and the result of this mode of procedure would be to produce a plane parallel, very likely, to the floor, but, at the same time, out of level if the floor is out of level. Now measure 1 inch, the thickness of the shelf below the levels A U, and D T, already traced, and having prepared the ledges K and L, as shown in Fig. 173, proceed to nail them to the wall, bringing the inner upper edges against the lower level lines just obtained. There is something, however, that I wish to say about the preparation of the ledges. After the front and top and bottom have been planed up, draw a pencil line along the central line of the front, as shown by the dotted line in Fig. 175; and with a gimlet bore holes through the wood for the reception of the nails at the places indicated. Then with a gouge scoop out the hollows shown in the illustration on each side of the nail holes; and after putting the ledges against the pencil lines indicating the lower level, nail them on with 4-inch wire nails, taking care not to drive the surface of the head of the nail below the level of the wood. The amateur carpenter will naturally wish to know why this should be done. It is to ensure an easy withdrawal of the nails from the wall should the cupboard be removed at any time; for facility will thus be afforded to grip the head of the nail with the pincers, and the edge of the hole will afford a fulcrum on which the pincers will turn when withdrawing the nail, which, if driven in in this way in the first place, will come away without injuring the wall.

Nailing on the ledges.

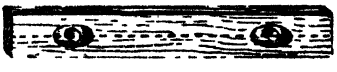


FIG 175 Mode of Nailing on Ledges to Walls.

326. The ledges being fixed, we will now return to the completion of the shelf. When you are applying slips to the wall to test accuracy, measure with the rule or with compasses the depth of the deepest depression or opening between the straight edge and the wall, between A and U, U and T, and T and D; and then trace lines parallel to D T and A U to the *right* of D T and to the *left* of A U just so far from each

Scribing ends and back of shelf.

of them as the depth of the depression. Then cut off the ends of the board along these lines. We want our work to fit into place with accuracy, and we are going to get it so if we can; but to do this involves another process, which is technically known as "scribing". Now, I had better show the home carpenter, on a larger scale, what is meant by scribing, and this I will do in Fig. 176, in which the end of a square board A, B, C, D, is required to be cut in such a manner that it may fit closely and accurately against the hollows and protuberances on the wall B C. The corners, B C, of the board are accordingly brought in contact with the wall at B and C, and a pair of compasses are opened to the width of the greatest hollow. The point of one leg is then run against the wavy surface of the wall, and the point of the other traces a corresponding wavy line along the end of the board, which is cut along the course of the line with a compass saw, or keyhole saw, and will then fit closely against the wall in every part. Now this is exactly what we have to do with the ends A U and T D of the shelf for the recess, and with the back also if it be necessary. The shelf will then drop in with accuracy on the ledges, but it must not be fastened down until all parts of the cupboard are ready.

"Scriping:" what it is.

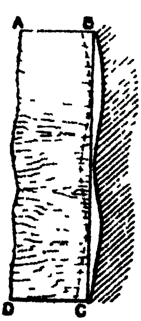


FIG. 176. Example of Scribing.

Skirting.

327. The next thing to be done is to put a bit of skirting across the floor with its face parallel to, or rather in the same plane, with the bit of skirting on the chimney jamb, if you wish to have a deep well at the bottom of the cupboard. In this case you must imitate the existing skirting, cutting it and shaping the moulding, if there be any at the top; but in this case you must screw a ledge along the inside of the new piece of skirting to carry the frame for the cupboard doors, the frame being screwed to the skirting from within; but this is a clumsy way of going to work, and I only mention it lest some amateur may wish to have a deep well for bottles at the bottom of his cupboard, divided into compartments; but, as far as I am concerned, I would rather go to work in another way, which I will describe.

Frame for cupboard doors.

328. This is to make a frame at once for carrying the cupboard doors. The construction of a frame in amateur fashion has been described so often that there is really no occasion to go through it again. Supposing that the doors which will be formed of single panels of wood jointed together, are ½ inch thick, with frame in mocking ⅜ inch thick, the frame must be made of wood ⅞ inch in thickness when planed down. If the top and bottom rails are 2½ inches and 3 inches respectively, this will be

wide enough: the sides of the frame must also be 2½ inches plus a piece of the thickness of the skirting board; thus if the skirting board be ⅝ inch thick, the styles of the framing must be 3¼ inches in width, and must be cut even wider to admit of scribing to the walls in the manner already described. The bottom of each style will have to be notched to fit over the skirting. Some, perhaps, wishing to preserve the frame entire, will prefer to make it to fit tightly between the skirting boards on each side of the recess, and to screw on a piece to fill up on each side of suitable length, notching it to fit over the moulding, and scribing it to fit the walls. The frame must be finished by breaking the outer arris round the interior of the frame with a beading worked on it, or supplied by tacking a thin slip round the inner edge of the frame, having its front edge rounded. For the fixing of the frame, a ledge must be screwed to the inner face of the top shelf, just the thickness of the framing, namely ⅞ inches, and a corresponding ledge must be screwed down to the floor, at such a distance from the back that the face of the frame may be perfectly upright. When the frame is ready it must be put aside, while the home carpenter turns his attention to other things, which must be done before the cupboard is fixed.

Provision for fixing frame.

329. One of these things will be the preparation of the middle shelf of the cupboard, which must be carried out in the same way as the top shelf, and should be fixed before the frame is put on. It must be so made that the frame may be fastened to it, and the doors of the cupboard close against it. The position of the ledge on which it rests may be determined by measuring downwards from the ledges above, which have been already levelled, and fixed in place. When ready the middle shelf may be laid in place ready for fixing; but it is better not to fix it finally until everything is ready, lest it require alteration or readjustment; in doing any work of this kind it is better to abstain from fixing any part until all parts are ready.

Middle shelf of cupboard.

330. The doors will now require to be accurately fitted to the frame, and hung or hinged to it before the frame is fastened in its place. To bed the doors with accuracy and nicety, lay the frame on the floor or bench, or any flat surface, and then try the door within it. There is one peculiarity about the door that must not be forgotten. When the doors are put in place they should have been made of such a width that there is an open space, of say ⅜ inch between them. To determine the precise width of the doors, we must bear in mind that A D in Fig. 175 was taken to measure 36 inches The styles of the framing at the sides were to

Doors of cup board.

Junction of doors

be 3⅛ inches in width when finished and ready for fixing, and we will assume that this includes the bead round the interior arris in front. Then 36″ − (3⅛″ × 2) = 36″ − 6¼″ = 29¾″; reduce this result by ⅜″, and we we get 29⅜ inches as the width of the two doors, or 14 11/16 inches as the width of each door. How then is the intervening space between the doors to be filled up? Why, by two slips, each 7/16 inch by ⅜ inch, one of which, A, is to be bradded to the door C, on the left hand, and the other, B, whose outer surface is rounded, is bradded to the door D, on the right hand in the positions shown. The effect of this is that when the doors are closed and the door C is bolted on the inside by the bolt F to the middle shelf of the cupboard, the end of the bolt entering a notch cut in the upper surface of the cupboard shelf, in the middle of the cupboard at a short distance from the edge, the slip B closes on and against the slip A from top to bottom, and when the bolt of the cupboard lock is shot it passes behind A, and the cupboard is duly locked. A professional would rebate the edges instead of bradding on slips.

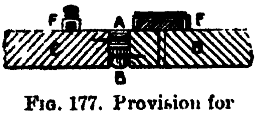


Fig. 177. Provision for Closing Doors.

Attachment of door to frame by hinges.

331. We now come to the hanging of the doors to the framework by means of hingeing, and the details of hingeing are shown in Fig. 178, in which A shows the upper left-hand corner of the edge of the top shelf, the framing and part of the door itself in elevation, with the upper hinge inserted in the proper place. At B the method of attaching the hinge to the frame on one side, and the door on the other side, is exhibited in elevation, the door being supposed to be put open to the utmost and thrown back on the frame, a position which is beyond possibility when the framing is fixed, but which is adopted here for the sake of clearness. Lastly, at C, the framing, hinge, and door are shown in section, to an extent sufficient to show how the valves of the hinge are let into the wood. The portion of the diagram shown at A needs but little remark, but it will serve to show how the hinge is let into the beading of the frame on one side, and the edge of the door on the other, and how the back of the hinge projects slightly beyond the continuous plane, which is formed by the outer surfaces of

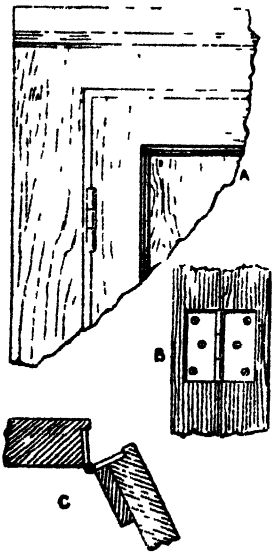


Fig. 178 Details of Hingeing.

the framing and the door. The part at B shows, as far as can be shown, the narrow opening between door and frame, when the door is set open and the position of the hinge when wide open for attachment to edges of door and frame, from which it will be apparent to the home carpenter that recesses must be cut in each to receive the valves or flaps of the hinge. At C an attempt has been made to show how the recesses should be cut, and that they should be slightly slanting, and deeper at the edges of the flaps, than at their circular pipe-like junction through which is passed the wire that holds them together. This is done to give due play to the hinge, and to prevent any binding or tendency to strain which might, and perhaps would, happen if the back of the recesses were strictly parallel to the edges of frame and door; and further to prevent any chance of the touching of the heads of the screws, which would in itself cause a strain on the hinge, and tend to draw it from its position. If the amateur wood worker finds at any time that either or both of the recesses have been cut too deep, he must bring the hinge up by putting pieces of thick brown paper or thin cardboard behind it to an extent and thickness sufficient to bring the hinge into place and easy working.

Fitting parts of cupboard together.

332. All the separate parts being now ready, brad a slip of wood across the frame from within, above the place where it will touch the middle shelf, and another below it to keep the doors in position. Place the middle shelf on its ledges, then set the framing upright in its place, and drop the top shelf on its ledges and the top of the framing. If all fits nicely and snugly together, well and good; but if any easing is needful here, or adjustment there, it should be done now, before the final work of fixing is carried out. Now remove the top shelf, and see that the edge of the middle shelf butts closely against the frame. This done, take away the frame and screw down the middle shelf, with screws passed through it into the ledges skew-wise, as shown in Fig. 179, and which must be done here because it is not practicable to put in the screws straight, in consequence of proximity to the wall, and abrasion thereby of the knuckles when working the turnscrew, to which any one who is reasonably careful of his skin has a natural objection. In fact, skew-screwing and skew-nailing are modes of inserting screws and nails which the amateur will frequently find not only useful but absolutely necessary. The middle shelf being fixed, now put the frame in its place. Screw it at the bottom to the ledge or strip that has already been nailed to the floor, across the opening of the recess, and

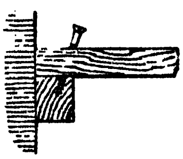


FIG. 179 Screw set skew wise.

Fixing middle shelf: skew screwing.

Fixing frame and top shelf.

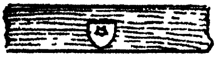


FIG. 180 Provision in Ledges for Attachment of Top Shelf

screw it also to the middle shelf by a screw put in on each side. Now drop the top shelf into its place, and fasten the top rail of the framing to the ledge that has been screwed on to the inner surface of the top shelf as a suitable distance from the outer edge. Use fine, but long screws—say 2-inch screws—for the attachment of the frame to the ledges and middle shelf, and turn the screws in till the head is slightly below the surface, the screw holes having been countersunk for this purpose with a rose bit. All this being done, open the doors and remove the strips that have been bradded to the frame on the inside, and, having the doors wide open, proceed to fix the top shelf. When speaking of the ledges on which the top shelf rests I omitted to say that a couple of recesses should have been taken out in each, with a gouge, in the manner shown in Fig. 180, the slope of the recess being as nearly upright as may be, so that fine screws may be passed upwards, slightly skew-wise, through the top of the ledge and into the lower surface of the top shelf, so as to hold it in its place. It is a far neater way of managing this part of the work than by screwing it down from without, which only tends to the disfigurement of the top shelf. The cupboard is now fixed, and, as the lock and keyhole should have been attached and cut when the frame was made, there only remains to make the notch in the middle shelf for the reception of the cupboard bolt, which is soon done after its position has been marked.

Materials, etc.

Casing on top shelf.

333. I have said nothing about materials, as the timber to be used must be left in all cases to the judgment and requirements of the home workman, who will be guided mainly by circumstances of various kinds, which will embrace position of cupboard and length of pocket. Oak or mahogany for a dining-room, walnut or any of the fancy woods for a drawing-room, look well, and pine painted or stained and varnished, or even showing the natural wood varnished, looks well for a morning-room. Generally a mahogany top shelf or slab with a framing, and doors of pine or good deal, looks well in combination. As a finish I like to see a casing or lining about 3 inches in height, just round the walls, resting on the back and sides of the top shelf, as it protects the wall, whether papered or worked in Gypsoline, when the top of the cupboard is oiled and rubbed as it should be, to impart a polish to it. It must also be a matter for the consideration of the wood worker whether or not he will have mirrored fronts to his cupboards, if in drawing-room or dining-room, although the

former would be a room in which I should never think of putting dwarf cupboards myself. I may add that in all work of this kind, unless it be sought to match the rest of the wood work in any room, paint is the very best kind of finish that I care about. The palm must always and ever be assigned in all house joinery and cabinet making to natural woods, with their natural beauty enhanced by polishing or varnishing, both of which are decidedly good in their way.

Treatment of recess above cupboards.

334. Some, perhaps, will wish to utilise the part of the recess yet unfilled above the dwarf cupboard, while others will not. To those who do not wish to fill the recess with some outcome of their handiwork, I will suggest the desirability of filling it, or them, with mirrors carried up to the cornice if there be any and suitably framed, not with gilt work but with the natural wood used in the construction of the dwarf cupboard itself, polished, or varnished, and relieved only with a piece of gilt strip running round the inner edge of the framing. Failing a mirror, a good picture or two. For those who desire additions of a more useful character, bookshelves are worthy of attention; and it may be as well to give a hint or two on the construction even of these. The top shelf, forming as it does a species of sideboard, is a natural position for a lamp, unless the room be lighted by gas, when the recess immediately above the shelf may be filled with a handsome vase, or other articles in porcelain or pottery. In Fig. 181 I give a suggestion in elevation for bookshelves to fill a recess, leaving ample room between the bottom shelf of the bookcase and the top shelf of the dwarf cupboard for things other than books. As I am not—being without space in this volume—showing the home carpenter how to make furniture, I do not pause on my way to describe the making of a bookcase; I will merely say that above are shelves graduated to take successive sizes of books; below, two modes of treatment are shadowed forth for the utilisation of the remaining space, namely, the entire space being left open and surmounted by a shallow Tudor arch in wood, lightly ornamented with carving, as shown to the right, or as shown

Bookshelves above recess.

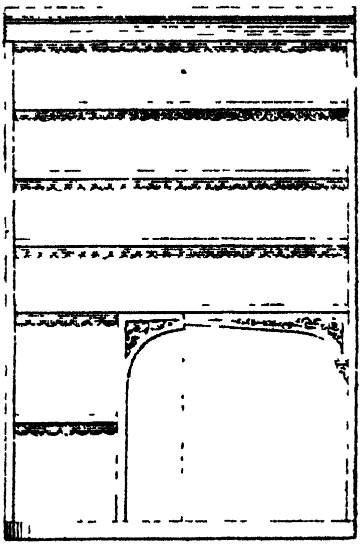


Fig. 181. Suggestion for Bookshelves above Dwarf Cupboard in Recess.

to the left an arched central recess, sufficiently high and wide to take a lamp, flanked by recesses to the left which may be utilised as shelves for larger, or, at all events, taller volumes, or as tiny cupboards with doors, either solid or of fretwork, for the reception of papers. The bookshelves need be but deep enough to contain from front edge to back the largest books that are likely to be placed in them. They should by no means be deeper than this. I lay stress on this to prevent any one from seeking to make them the entire depth of the recess. It remains with the home carpenter to decide whether or not he will make them with glazed doors. Should he do so, the doors should be confined to the bookcase above the intermediate space. The narrow bookshelves at the side may be enclosed, if so desired, with smaller doors, entirely independent of the doors above.

Cupboards for recesses in bedrooms and their type.

335. And now we come to the longer cupboards, cupboards suitable for bedrooms extending upwards from the floor below to the ceiling above. I will commence here by describing the kind of cupboard that I regard as the best type for cupboards in the recesses of bedrooms; and later on, I will give diagrams in elevation, showing the exterior of one of these, and the interior arrangements. Firstly, I object *in toto* to the builder's abbreviated cupboard, which falls short of reaching the top, and which assumes the form of a deep recess about 12 inches or thereabout in height, roughly boarded over, and forming, as I have already said, a catchpit for dust and accumulative dirt, that is seldom visited, cleared and rendered sweet and wholesome by cleansing hands. Mr. Gerribilder and compilers of houses of his stamp doubtless charitably meant these well nigh inaccessible nooks to form resting places for hat boxes, bonnet boxes, etc.; but we, that is to say, my readers and myself, will carefully avoid them. But let me proceed to describe my type of a more perfect and useful bedroom cupboard, that the home carpenter may make. Outwardly it will appear as though consisting of two parts,- a drawer below and a cupboard above, and so it really does; but when the cupboard doors are open the cupboard itself will be found to consist of two parts, namely, a cupboard in chief of sufficient height to admit of hanging up ladies' mantles, dresses, and other etceteras of feminine clothing which I need not particularise, and above this a lesser space, equivalent to, but not identical with, Mr. Gerribilder's exposed dust hover, cased in with a glazed cover, through which the articles placed there are always in view, in which may be placed furs, muffs, and ornamental apparel, which are not always in use, and which require more careful preservation than clothes which are subject to every day wear.

336. Before going into details and diagrams, let me endeavour to describe one of these cupboards more particularly, and with as much attention to proportions as I can; and let us regard the cupboard as removable, complete in itself, and, therefore, removable with comparative ease, when it pleases the occupier to quit the dwelling in which he has put it up. Like houses, cupboards require a good and solid foundation; and this ours shall have. The skirting of the bedroom, let us suppose, is a plain skirting, having a perfectly flat edge at the top. To this, however, screw slips of wood at the sides and at the back, so as to make the skirting in the recess at least twice its original thickness, and bring it to the height of 6 inches at least, so that the floor below may be wiped over with a damp cloth when needful to secure it from accumulation of dust. The skirting may be raised to the height of 7 or even 8 inches if you will. Do not put any trust or confidence in the floor, or start your work on the assumption that the floor is level. See that the top of your additional boarding is level all round, and fill in the top of the original skirting, if it be requisite, with slips of wood that will bring it to the same height as the new work. In this you will have a secure basis for the structure you are about to rear above.

Addition to skirting board.

337. The next thing to be done is to make a casing which will in reality form the bottom, sides, and top of the cupboard; and let us suppose, as before, that the recess is 14 inches in depth, but 42 inches in width, and that the room is 9 feet 6 inches in height from floor to ceiling, a fair average height for bedrooms in an ordinary house of ordinary character. Further, as we really want greater depth than the recess affords, let us bring out the cheeks that have been screwed to the recess to the depth of 17 inches, in the manner shown in Fig. 182, which is not to scale. In this A B C D represents the original skirting; E F G H, the new pieces that are screwed to the original skirting to augment its thickness, and M an additional fillet screwed on to E F at the corner E, to bring this part out to the width of the augmented skirting throughout. The boarding which is intended to form the bottom of the casing of the cupboard, and is placed on the combined skirting, is represented by L B C K. Then from B to E is 17 inches, and from B to C 42 inches, as shown. The boarding L B C K that represents the bottom of the casing, projects 1 inch beyond E H, the outer limit of the increased recess, and is

Basis or foundation for cupboard.

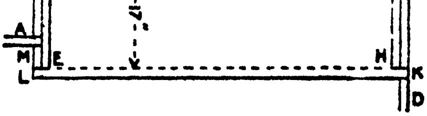


FIG. 182. Skirting in Recess augmented by Boarding to increase Thickness.

rounded in front after the manner of the nosing of the treader of a stair.

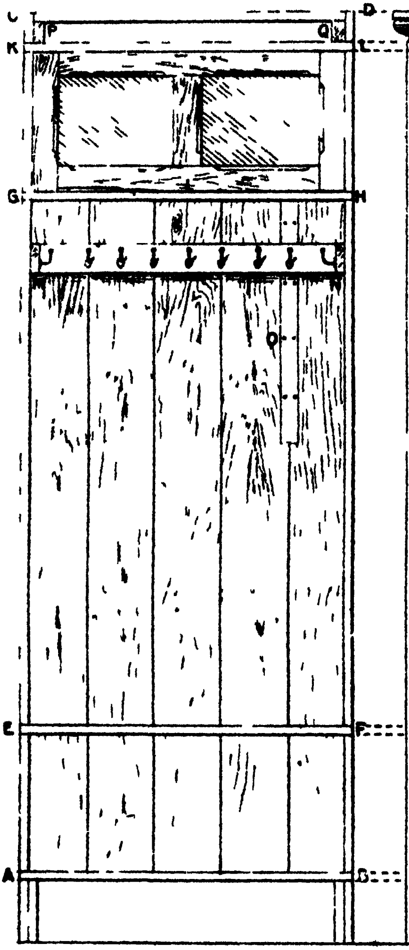


FIG. 183 Interior of Cupboard in Bedroom, showing Construction of Casing etc

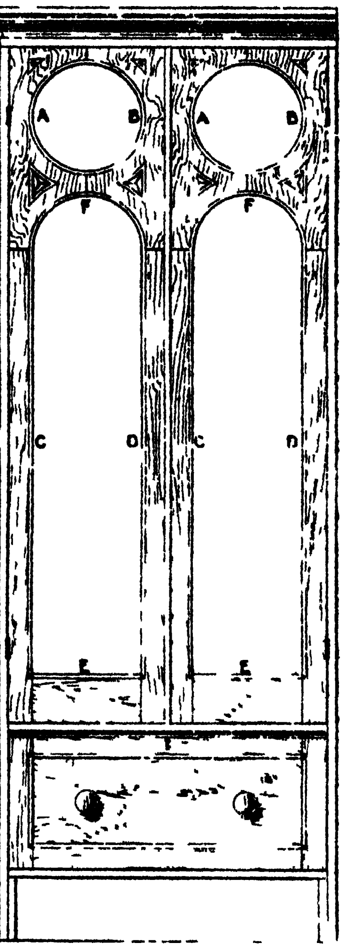


FIG. 184 Exterior of Cupboard in Bedroom, with deep Drawer below Cupboard

338. It will be helpful to the reader if I give him at once two diagrams in elevation, one of which, namely, Fig. 183, exhibits the interior of cupboard in bedroom, showing the construction of the casing and the enclosed space above, of which I have already spoken. In the other, Fig. 184, an elevation of the exterior of cupboard is given, showing the recess open at bottom below the cupboard itself, the deep drawer at foot of cupboard, and the doors which

extend upwards from the bottom board to the top board of the casing, above which is the cornice, which is necessary as a finish. I will first deal with the construction of the casing, which will be made complete in itself, and in such a manner that when the cupboard is finished nothing more will remain to be done than to lift it into its place. The reason for adopting this course is that it is not likely that a cupboard that is made to fit a recess in one house will readily adapt itself to fit a recess in another, and, therefore, much of the labour spent in making the cupboard would be thrown away. But, if it be made in the manner I am about to describe, there will be no difficulty in converting it into a small wardrobe by returning the cornice round the sides, to do which a fresh piece in front will be required, and by putting it on a plinth, or on feet of some kind—broad flat knobs will do if the room in which it is to stand is not lofty enough to admit of a good bold plinth, or of turned feet. This, to be sure, is looking well ahead, but it is necessary to do this sometimes, even in a job in joinery.

Bedroom cupboard not as fixture.

339. Before I go any further it will be necessary to caution the home carpenter to be careful in measuring up the recess in which the cupboard is to stand, before he commences work. He has seen in the case of the dwarf cupboard how little he can depend on the plastering, and it will be needful for him to measure the recess most carefully at back and across the front in at least three places, namely, at the top, in the middle, and at the bottom, and to take the *narrowest* measurement of all as the actual width of the cupboard. If he is not careful in doing this and works to outside instead of inside measurement, or rather measurement across the front of the recess instead of measurement at the back, he may find that it is not possible to get the cupboard into the recess when made, or if he manage to get it in it will be at the cost of injury to the sides of the casing and of more or less damage to paperhanging and wall, both of which things he will wish to avoid. Having ascertained the minimum width of the cornice, this will be the width of the cupboard. Further, as we are going to make the cupboard in such a manner that it will not be a fixture in any way, it will be as well to make the space below the cupboard 7 inches in height instead of 8, and screw boards across on the cheeks which have been attached to the skirting and the piece at back, to complete the substructure on which the cupboard will stand. It may be pointed out that the space below will afford a useful place wherein to put boots and shoes, which are so often found to be in the way through want of some eligible spot in which

Caution to home carpenter.

Good place for boots and shoes.

to put them. Here they will be out of the way altogether, but still ready to hand when they are wanted by the wearer.

Construction of carcase of cupboard: side pieces.

340. But let us now proceed with the construction of the case. We assumed that the height of the room from floor to ceiling was 9 feet 6 inches, and taking away the height of the open space below it, covered or not covered in, as the home carpenter pleases, we get 8 feet 10 inches as the height of our cupboard, and perhaps we had better reduce this still further by 1 inch, so as to give a little play when lifting the cupboard into its place. Having arrived at this, and remembering that we brought out the boarding at the bottom of the recess to the extent of 17 inches, we find that we shall want as sides for the cupboard two pieces of boarding 8 feet 9 inches long and 17 inches wide. The boards used had better be of such thickness as to plane down to 1 inch, as we must have a substantial carcase for our cupboard. The sides had better be made of two lengths of board, 9 inches in width, properly jointed together and glued up. By the time the edges have been planed and shot for the joint and also on the edges in front and at back, we shall find that they are not far over 17 inches, and that they can be easily reduced to this. Let us hope that the very narrowest width of the recess at back is 42 inches; at all events, as we are proceeding hypothetically we will assume that it is so, and work accordingly. As our sides are 1 inch in thickness, we find that we shall want three pieces of board 40 inches by 18 inches by 1 inch, and one piece 40 inches by 16 inches by 1 inch, the extra inch, or three of the four pieces required as regards width, and the extra inches in length, being necessary to get the nosing on the pieces A B, E F, and K L, and the projections on each side which butt against the sides of the carcase A glance at Fig. 185 will show the reader precisely what I mean, A B being a corner of the bottom piece, and C D a section of the side piece. The pieces A B, E F, and K L, must be carefully squared up and sawn to this shape. The piece G H, being inside the doors and the doors shutting against it, will be of the dimensions already assigned to it above.

Transverse shelves.

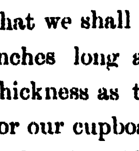


Fig. 185. Sectional Diagram showing Attachment of Transverse Shelves to Side Pieces.

Nailing parts of cornice together.

341. Our next step will be to determine the exact position to be occupied by the transverse pieces E F and G H; and there will not be much difficulty in doing this. Firstly, the space allowed for depth of cornice is 3 inches; so the depth of the lower surface of K L from the upper end of the side is 4 inches; and as the depth of the inside cupboard from

Grooving for shelves.

the lower surface of K L to the upper surface of G H is 18 inches, we have to measure from upper end of side 3″ + 1″ + 18″ = 22 inches, to find position of upper surface of G H. Mark off with the square two parallel lines, 1 inch apart, to show position of G H. At the bottom, as A B is 1 inch in thickness, and the space allowed for the drawer below the cupboard is 18 inches, we get 19 inches from lower end of side for bottom surface of E F, and 20 inches for upper surface. Mark position with the square, as for the cross pieces at the top. Now, the total length of side was 8 feet 9 inches = 105 inches, and subtracting from this 22″ + 20″ = 42 inches, we get 63 inches as the height of the cupboard from upper surface of E F to lower surface of G H, which affords all the room necessary for hanging up any article of clothing. Put the cross pieces in place, and nail the sides to them with 3-inch wire nails. In this I have shown the home carpenter a simple but strong way of making the carcase of his cupboard; but if I were doing such kind of work for myself, I should cut each cross piece except that at the bottom ¼ inch longer than the length given above for each, and then make shallow grooves across the sides, just ⅛ inch in depth, into which to fit the ends before proceeding to nail the parts together. It is a safer and better way of going to work. The bottom of each groove will be reduced to uniformity by the aid of a router. Before proceeding any further I should plane up a piece, M N, 41 inches long and 3 inches wide, and notch it into the back, halving the notch, that is to say, cutting out a piece ½ inch square on the *front* of M N at each end, and taking out a corresponding notch in the sides at the back. This would be to carry hooks on which to hang articles of clothing as shown. It would be returned along the sides, as shown in section at M and N, falling short 1 inch of the edge of the sides.

Back to cupboard.

Match-boarding: its construction.

342. It will now be at the option of the home carpenter whether or not he puts a back to the cupboard. It must depend very much as to his intention with regard to the space at top. If he intends to leave it open, and to use G H only as a shelf, it may be left without a back; but if he determines on enclosing the space, it will be desirable, and indeed necessary, to put a back to it. This may be of match-boarding, which should be planed up at the back, and put up to show the bead that breaks the joint within the cupboard. I do not myself like match-boarding, and I never use it if I can help it. The grooving and tongueing are merely done to prevent any opening between boards jointed when they shrink. My own way of putting up the back would be to use well-seasoned wood, ½ inch thick and 9 inches wide. A fifth part

of 42 inches is 8⅖ inches, so when the 9-inch boards are planed at the edges and shot and trued up, it will be found that they are in no way too wide. Nail on the first board, putting in nails at intervals of about 6 inches along the side from top to bottom. Mark carefully with pencil lines the space at which the first board touches the shelves A B, E F, G H, and K L, and carry the board right up to the line C D, leaving it a little beyond this line, as indeed it may also be extended beyond the lower surface of A B, to be taken off level with the tenon saw afterwards. Do not nail the board to the shelves before the second board is put on; and when this is done, glue the edge of the first board from end to end, and bring the second board close up to it, bringing them together by clamps. Do not release the clamps until the joint is hard and dry, which it will soon be if cold waterproof glue be used. Then nail these boards to the shelves, and glue up and clamp the third, and so on for the fourth and fifth. After clamping up the fifth, nail it to the side piece at the outer edge, and take off with the plane any part of the edge that may project beyond the line of the outer surface of the side piece. If the amateur wood worker does not care to take the time involved in gluing up bit by bit, he may put on two boards, one at each side, nailing them down to the side pieces, and then lay in the intermediate boards, cutting them full and springing two of them into place as previously shown. If the wood be not well seasoned and shows any tendency to shrink, the cupboard or wardrobe subsequently may be rendered dustproof by bradding thin slips over the joints in the manner shown at O. Finally, above the shelf K L screw to the sides and attach to the back by screws from without slips as shown in section at P and Q. Do the same to the interior of the cornice, and on the ledge thus formed drop in and nail down thin boards laid down to cover in the space behind the cornice. I never like to leave any well-like space that may serve as a receptacle and a storage for dust and dirt. This completes the construction of the carcase.

How to put on a back.

Construction of drawer.

343. Next let us take the construction of the drawer, which may be made in the same way as the carcase, that is to say, of sides, back and front, nailed together box fashion. I will give a plan of the interior of the drawer, and a sectional view of it which is also partly in elevation, on the same scale as Figs. 183 and 184, and as is done in Figs. 186 and 187. The length of the drawer, which should be made of 1-inch board, nicely planed up, which will reduce its thickness to ⅞ inch, will be 40 inches, outside measurement, and the width 17 inches, including everything, that is to say, to be more specific, the mocking, on the exterior of the

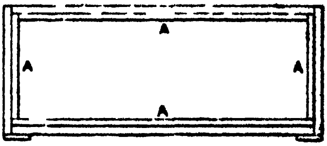


Fig. 186. Plan of Interior of Drawer.

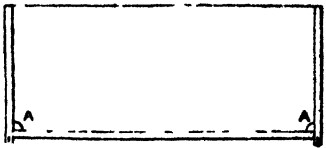


Fig 187 Sectional View of Interior of Drawer.

drawer, if mocking be resorted to. The diagrams are drawn on the assumption that mocking will be resorted to. Now before going any further let me say this, namely, that if the front of the drawer is intended to be perfectly plain, and in one plane without relief, let the back and front be nailed to sides; but, on the contrary, if the front is to be mocked, nail the sides to back and front as shown in Fig. 186. As the depth of the opening from A B to E F, as shown in Fig. 183, is 18 inches, so the depth of the drawer externally will be 18 inches easy. Internally, however, the drawer will not be so deep; for, as shown in the sectional view in Fig. 187, or as may be inferred from it, the depth of the front and sides will be 18 inches, but the depth of the back will be less by ¼ inch, to prevent any chance of its dragging on the shelf A B, when the drawer is pulled out and pushed in. The bottom of the drawer will be ⅞ inch thick when the stuff is planed up, and will be dropped in on a ledge with the upper outer edge rounded off as shown at A, in both Fig. 186 and Fig. 187, and front sides and back will then be nailed to the bottom from without. This will make the depth of the drawer within 16⅞ inches. All this is on the supposition that the front of the drawer is to be mocked; and if the mocking is ⅜ inch in thickness, the length of the sides from back to front will be 17 inches less ⅜ inch, and this must be taken into account when cutting the sides to length.

Proportions.

344. Thus far the construction of the drawer itself. Little need be said about the mocking in front, which is bradded on round the exterior of the drawer, and should be of the same width as the mocking of the doors above, which will be 2¼ inches wide as far as the styles. It may be put on in the form drawn, that is to say, with nails across the entire length of drawer from side piece to side piece, or across the entire length of drawer with side pieces, as muntins are put in; or, if preferred, the corners may be mitred together. Provision must be made for pulling the drawer out by screwing on knobs, or by attaching swing handles, which latter, perhaps, will be found to be more convenient, because they do not project so far as knobs, and therefore, the dresses of those who use the cupboard are less liable to be caught in them or by them. Lastly, the drawer is a heavy drawer, and continual use has a tendency to

Mocking of drawer.

Knobs, handles.

wear away the shelf or runner on which the drawer moves. It will therefore be better to attach some contrivance, by which the passage of the drawer to and fro may be facilitated. This may be found by putting the sides of the drawer on metal tracks, say $\frac{1}{16}$ inch thick, let into grooves cut to receive them in the upper surface of the bottom shelf, screwing on a corresponding strip of metal to the sides of the drawer, planed down slightly to admit of the addition. Or, as shown in Fig. 188, two small metal wheels, working on an axis composed of a large wire nail, may be let into each side, buried so deeply in the side that they are nearly concealed, and projecting but very slightly beyond the lower edge of the slide, may be used instead to work on the metal track grooved into the lower shelf.

Wheel and rail for drawer.

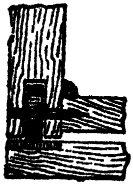


Fig. 188. Wheel and Rail for Drawer.

315. We come next to the construction of the door by which the upper compartment is closed, and so closed as to remain so when the cupboard doors are open. It may consist of a single door made in two panels, as shown in Fig. 183, and glazed, in which case either the upper or lower edge of the door may be rounded, and it may work on pins inserted through the sides. In this case, to render the cupboard dustproof, it must work in a grooved piece of wood made as shown in Fig. 189, and close against ledges, nailed round the sides and surface of shelf opposite to that on which the rounded attachment is placed. If the rounded joint be at the bottom of the door it will open outwards and downwards from the top; if at the top it will open outwards and upwards, but, although it presents a pretty appearance in this form, it is, and probably will be, found inconvenient in practice. It will be better, therefore, to attach two slips to the sides of the cupboard at the distance of 1 inch from the outer edge to which to hinge the doors, of which there should be two closing against three ledges within the cupboard, and meeting and closing after the manner of dwarf cupboard doors. The doors should be made of wood 1 inch thick and 2 inches wide, rebated from the back so as to take the glass, which must be secured in its place by slips bradded in all round the rebate. This form is shown in No. 1, Fig. 190, in which three different ways of framing the door are shown. Here F is the solid wood of which the frame is made, rebated as at S, and G is the glass, rendered by a thick black line for

Door of upper compartment.

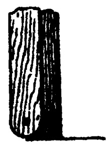


Fig. 189. Rounded Joint for Door.

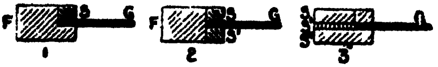


Fig. 190. Three Modes of making Door Frame.

How to make frame of door.

distinctness sake, and s shows the slip bradded into the rebate behind to keep the glass in place. In No. 2 the next best form is shown. In this, F is the solid wood, s′ a slip bradded round in front as a bearing for the glass and to form the rebate, and s the slip at the back as before to keep the glass in place. These forms are preferable because they present a solid framing to which to attach the hinge—preferable by far to No. 3, in which the worst form of construction is shown, and which is the worst, not through any deficiency of strength, but because of the possibility of the easy withdrawal of the screws by which the hinge is held to the door, should it be subjected to any sudden wrench. It is formed of three thicknesses of wood, one of which, s, is $\frac{1}{2}$ inch thick, the intermediate piece, s′, of the thickness of the glass, which will be in all probability $\frac{1}{8}$ inch thick. These two pieces must be glued together, and firmly held with clamps until dry. Then s″ must be screwed on to the part below to hold the glass in place. It must only be screwed on so that it may be easily removed if the glass gets broken, and it is found necessary to put in a fresh piece. A better way would be to glue s″ and s′ together, and the part of s on the left. Then to lay in the glass in the rebate thus formed, and brad in the remainder of s to the right, or its equivalent in slips to hold the glass in place. I do not think it is needful to go any further into this, because enough has been said to enable the home carpenter to work out the dimensions, and to make working drawings for his own guidance in the work of construction.

346. Lastly, we come to the doors of the cupboard itself; and these doors in height are 63″ + 1″ + 18″ = 82 inches, or 6 feet 10 inches. Each door is 20 inches in width, or $20'' - \frac{3}{16}'' = 19\frac{13}{16}$ inches, the remaining space of $\frac{3}{8}$ inch being filled by slips, one nailed on to one door, and one to the other; so that one door, preferably that to the right, may close against the slip attached to the door on the left. These doors should be made in pieces $\frac{1}{2}$ inch thick or thereabouts, and presenting a single piece of boarding at the back, if they are to be fitted with mirrors; but $\frac{5}{8}$ inch thick if they are to be mocked with mocking $\frac{3}{8}$ inch thick, because the doors of our cupboard are to be mocked doors. If, however, it is determined to make the mocking of the cupboard doors only $\frac{1}{4}$ inch thick, the solid door behind may be $\frac{3}{4}$ inch thick. If, however, it is decided to insert mirrors in the doors, then the panel behind must be $\frac{1}{2}$ inch thick, and the mocking $\frac{1}{2}$ inch thick also. The mocking must then be cut to a proper width, which we will arrive at directly, and the mirrors then laid in place on the piece at the back, and held in place by a bead laid on the mirror and bradded all round to the mocking.

Construction of cupboard door.

Mocking of cupboard doors.

Dimensions of mirrors.

Filling circular panel.

347. And now for the mocking itself. It will be understood that the larger spaces only on the doors, namely, the large arched panels, are to be filled with looking glass. The mocking must be put on in parts, and therefore cut in parts, and a glance at the illustration given in Fig. 184 will show that it is to be cut in five parts, namely, the parts worked in arcs of circles shown at A and B in each door, the styles shown at C and D, and the rail shown at E. The entire width of the mocking is to be 2½ inches, and the width of the bottom rail 6 inches. We will assume that the thickness of the plate glass used for the mirror will be ⅛ inch thick. Therefore, cut the styles C and D 2¼ inches wide, and lay these and the rail at foot of door in place; attach them with glue throughout, and clamp them firmly together in every part, so as to form what I trust will be, owing to the tenacity of the glue, a solid mass that will prove inseparable. As the homogeneous part of the door below is $19\frac{13}{16}$ inches wide, and the styles taken conjointly occupy a space of 4½ inches, the width of the mirror will be $15\frac{5}{16}$ inches. Lay the mirror in its place, and secure it there by a bead ⅜ inch deep and ¼ inch wide, which will bring the width of each style up to 2½ inches, and the rail at E to 6 inches as originally determined. Now prepare the upper pieces of mocking, cutting them in the form indicated. Cut the arcs that meet at F to form the semi-circular head of panel ¼ inch less than the rest of the circular mocking, as the beading at F, like that at C D E, must be removable in case the mirror be fractured, and the insertion of another be necessary. Incise the triangular spaces above F in the manner shown, and the small spaces above after the manner of chip-carving, and work a ¼-inch bead round them. Cut out the semi-circles at A B with a radius ¼ inch less than that used to take out the arcs at F, and work a ¼-inch bead round the circumference to match the rest; also work a rebate behind with a router to admit of the insertion of a decorative panel in some fancy wood used in fret-cutting, or a group of flowers, animals' heads, landscapes, or any thing to the wood worker's fancy, painted on wood, metal, or millboard. Glue the decorative work to the backing, and then glue on the mocking, and hold it in place by clamps. It is better not to glaze the decorative work. If the home carpenter determine to do this, he must confine it in place by a beading pressed into place and bradded down as it is forced into place. The beading at F *must* be bent and bradded in, and so may the other; but I have shown how to avoid this, and the home carpenter must please himself as to whether he takes the one course or the other. In putting in the beading at F, it may be found necessary to help the bending

by making slight saw-kerfs at intervals with a very fine doyetail saw; but if the amateur carpenter steams the wood to be used by suspending it over boiling water, or water nearly at boiling heat, in a copper or large oval boiler, or soaking it in boiling water, he will find the work easier. It is only when the wood is used cold and unsteamed that cutting nicks with the saw is necessary; but this should be avoided, if possible, because the saw kerfs cannot be altogether obliterated, and the work of bending by this means is never so perfectly carried out as when the wood is steamed or soaked in hot water.

Beading of circular work.

348. Nothing now remains to be done but to hang the doors of the cupboard to the sides with suitable hinges, which will require no further explanation than that which has been given in a previous section. As to material, the home carpenter will please himself; but I may say that ash, varnished or polished, will be a wood suitable for the purpose, and such as will present an excellent appearance when finished. I mean ash for the mocking only, the rest may be in white or yellow deal lightly stained and varnished. The cornice will be, perhaps, the last part to be put on, and then the top boarding already alluded to must be dropped in and fastened down to the ledges already attached to the sides and back; and now to the cornice in front, a lock should be placed on the cupboard door, and a box lock on the drawer, and then all will be complete. There is an alternative way of making cupboards frequently adopted in making wardrobes, and that is to surround the front with a frame nailed or screwed on to the sides, top and bottom, and in this frame to hang the doors; but a frame in the cupboard above described would be in the way, and interfere with the interior arrangement at the top of the cupboard.

Hanging doors.

349. We are now drawing near the end of our subject, and the only thing in the way of cupboards that remains to be touched on is the formation of a cupboard, or a series of small cupboards, in an attic. In many attics the roof springs directly from the wall of the house, or at a little distance above it; and the window or windows are run out from the roof in the form of small gables. Thus there is often a low space on one or both sides of an attic, terminating in a foot or two of wall, if not in an angle. To have such a space as this is ugly, and possibly depressing. It would be so to me; for the narrowing down of any roof or covering such as a roof creates such a feeling; although I must say I do not object to it in a span-roof vinery or glazed house for cucumbers, tomatoes, etc. Let us see what we can do, in the few pages that yet remain for the completion of the first part of this

volume, to relieve this unpleasant appearance, and by enclosing the utmost possible of the angular slope to form recessed cupboards, that will be quite as useful, but by no means so objectionable, to look at.

Construction of attic chambers.

350. The construction of an attic chamber made in the roof of a dwelling house is, without doubt, well known to most of my readers, and I will not dwell long upon it here. Nor will I linger or loiter in explaining the difference between an ordinary sloping roof, in which the rafters spring at once from the wallplates laid on the tops of the walls, at front and back and on either side, and the mansarde roof, an ugly cross or hybrid, resulting from a compromise between roof and wall, which looks very much as if the roof had been pushed upwards and outwards horizontally along its centre, until the lower part began to drift towards the upright, and the upper part towards the flat, meeting at their junction in a very obtuse angle indeed. The mansarde roof was devised by a French architect of that name, to make the topmost rooms more roomy than they were on the attic principle. I never was inside a chamber in a mansarde roof, and probably I never shall be, so I cannot speak as to their capabilities for cupboard room; but judging from the external appearance, I should say their capabilities in the cupboard way are by no means great. But, on the contrary, the capabilities of attic chambers in the way of this sort of thing are great; and I will soon show in what manner they are so, and how I would make use of them.

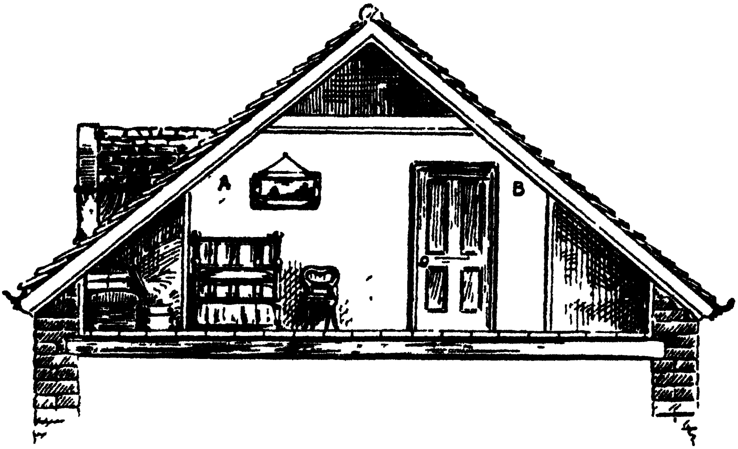


FIG. 191. Sketch View of Attic, showing End Elevation and Section

351. In Fig. 191 I have sought to give a sketch view of an attic proper,

if I may be permitted to resort to heraldic phraseology, constructed within the very limits of the roof itself; a room that has the dubious merits of being the coldest possible in winter, and the hottest possible in summer, the direct opposite to the cellar or basement, right away down in the heels of the house, which preserves a far greater equality of temperature—I had almost written equanimity of temper,—warmer in winter and cooler in summer, than rooms of greater pretension that are above its level. A glance at Fig. 191 will show that in its original state, it is permitted to stretch in width from wall to wall, under sloping roofs that seem ready to fall on and crush its too often needy occupant,—a room which in its natural state is very much ceiling and very little wall capped by a little flat of actual horizontal ceiling, which hides the angle in which the rafters meet in close embrace, under the capping of the roof ridge; "a thing of beauty and a joy for ever" in consequence to Mr. Gerribilder, Poor Old Uncle, Messrs. Muntin and Wallplate and the rest of the speculative building fraternity, because its decoration only calls for a bucket of limewash, which is hurriedly slapped on with a broad hand-brush,—and there's your attic. "Oh is it?" I always feel inclined to say; but I will show that there is yet room for a little wallpaper and labour in paperhanging, that will leave the humble attic in a condition of far greater comfort, than when, under the builder's general, not to say generous, treatment it posed as a very near relative of the historic "whited sepulchre".

The attic proper.

352. Reader, if you care to do so, lay something over the twin perpendicular lines that I have raised from the floor at a little distance with the angles in which roof and wall are brought together, and see how wide is the expanse that yawns from wall to wall, and how low the attic looks in consequence of its great floor width, very nearly thrice as much as its height, which I have placed by scale at ¼ inch to 1 foot at 7 feet. Now cover up the corners as far as the aforesaid lines perpendicular, and see how by the diminution of its width, the chamber seems to gain in height. Great length, remember, has always the effect of apparently lessening height, even as great height has the apparent effect of lessening length. The lowness of a room may always be apparently counteracted by perpendicular lines—especially in wall paper—from floor to ceiling, and great height may be apparently reduced by horizontal lines from side to side. By the perpendicular lines that I have raised, our attic has seemingly gained in height, and by the erection of partitions which I am about to speak of, wherever the angle space is unbroken by need of access to the window, whose form and

Length v. height.

usual position is dimly figured to the left, the occupant of the little bed in the corner will be spared the exercise of imagination in conjuring up troops of ghostly visitors in the gloomy angles in which they seem to lurk and hover, awaiting the first and earliest opportunity to pounce upon him in his bed when sleep shall at length have visited and sealed his wearied eyelids.

Change of aspect how caused

353. The metamorphosis of a room that is plainness unredeemed to one that is far more pleasing to look at and far more cheerful, can be effected, as I have said, by the erection of panelling, such as I am about to show in Figs. 192 and 194. I will, however, leave the description of these for a few minutes, while I strongly recommend the owners and occupants of all such chambers to paper the slopes of the roof at A and B with a pretty cheerful looking wall paper, as well as the walls at either end, and instead of renewing the whitewash on the ceiling when it has been removed by washing, to finish the ceiling with Gypsoline of a delicate tint, akin to that which predominates in the paper selected. This said, the way is cleared for mention and description of the panelling or *quasi* panelling, by which the shutting up and shutting out of the ugly angular spaces at the sides is effected, and the spaces themselves compelled to serve a purpose far more useful and important than any they have served before.

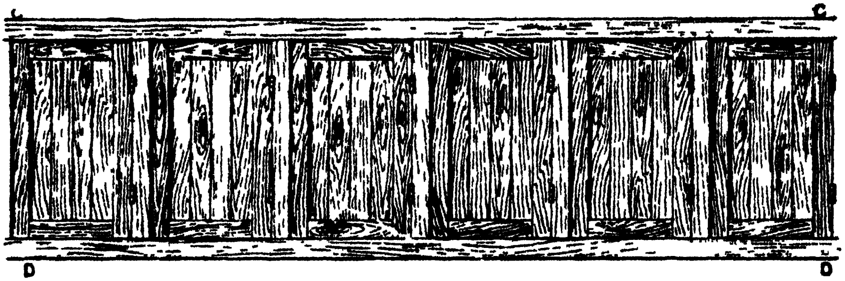


FIG. 192 Partition in Attic formed by a Series of Cupboard Doors

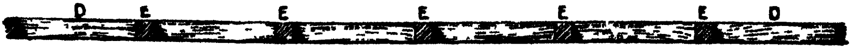


FIG. 193 Plan of Lower Part of Framing in which to Hang Doors.

354. Now, the object of the erection of the panelling is to provide cupboard room which will serve for the stowage of boxes and such articles of unused furniture and a variety of articles that usually find a resting place in a lumber room, if lumber room there be in a house that can be appropriated as such for their reception. I shall not go into hypothetic measurements when describing the two modes by which this can be effected. I shall

content myself with showing, or attempting to show, the home carpenter how the work may be done, and then leave him to take his measurements, and make working drawings in accordance with the circumstances of place and position that he is called on to deal with. The first kind of partition that I will deal with is the most simple in its character, and certainly the easiest to construct. The first thing to be done after determining the part of the attic to be thus enclosed is to mark its outside limit by a chalk line or a strong pencil line on the floor, and then to find where a perpendicular from this strikes the roof along which a pencil line must also be made. Having got this, ascertain the inclination of the roof to the perpendiculars, which should be erected from the floor by means of slips set in blocks, and transfer this to a piece of quartering about 2 inches square, or, to be more precise, about 2¼ inches by 2 inches, as at A in Fig. 194. Remove the arris or edge, as indicated by the dotted lines along the entire length, and having found the position of the rafters above, as at B, screw it firmly to them. Then cut two rails of equal length, as shown in section at C and D; cut the requisite number of uprights, similar to that shown at E, equal in height to that of the space between the rails and the quartering at C and D in addition. Connect the uprights and rails by mortise and tenon, or by halving the uprights into the rails from behind; that is to say, on the left hand of C and D, as in the diagram; make trial to see that the framing thus made fits closely and tightly between the chamfered rail A and the floor, and then fasten the framework into its place, screwing the upper rail C to A, and the lower rail D to the floor.

Mode of making partition and panelling to form cupboard in attic.

Framework for doors.

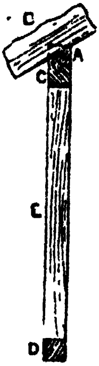


Fig. 194. Example of Framing for Partition in Attic.

355. Having done this, make the doors: enough has been said on the subject of doors, and after the instructions already given, the home carpenter will have, or ought to have, no difficulty in making them. The plan of the lower part of the framing, with the position of the uprights, is shown in Fig. 193, and C and D are shown in front elevation in C and D in Fig. 192. The upright E is shown at E, E, E, in Fig. 193, and is easily recognised in Fig. 192. Make as many doors as may be required to fill openings in frame, and then proceed to hang the doors to the uprights by hinges. It will be noticed that the hanging style for each door is the falling style for the door to the right of it. Fasten the doors by buttons screwed to the uprights. Should it be thought necessary to have larger openings at any time than those afforded by the doors, bear in mind that this is always

Doors in framing.

attainable by notching any or all of the uprights, into C and D from the back of the rails, and putting the ends to the rails by screws driven in from the front. When the screws are withdrawn, any of the uprights thus treated are easily removable after unhanging the door. Stops must be nailed to the framing to prevent the doors entering too far. Larger openings may be obtained by putting in every other part or upright, and making the doors in pairs like dwarf cupboard doors; but in this as in many other things in carpentry and joinery, that I have endeavoured to describe in this volume as clearly as I can, the amateur wood worker who resolves on tackling the job, must please himself.

356. And now we must proceed to consider the alternative mode of constructing the partition in attic, between the chamber itself and the angle piece to be hidden, and this consists in putting up a number of sliding shutters, working one behind the other in two grooves. Proceed as already described, to show limits of panelling on floor and roof, and to put up slips to show perpendicular lines from floor to roof. Make a chamfered piece as shown at A in Fig. 197, to which to attach the upper line of grooving in which the shutters are to slide. The only difference must be in width, as the groovings for the shutters will be much wider than the rails for the uprights shown in Figs. 192, 193, and 194. Thus, supposing that the shutters are $\frac{3}{4}$ inch thick, and they need not be thicker, consisting of boarding $\frac{1}{2}$ inch thick, and $\frac{1}{4}$ inch mocking, the grooving will assume the form shown in Fig. 197, and it will be easier for the amateur carpenter to build this up piece-

Alternative mode of framing in attic.

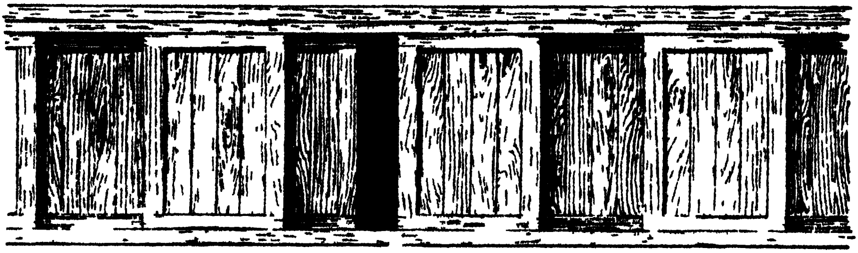


Fig. 195 Alternative Mode of Constructing Framing in Attic

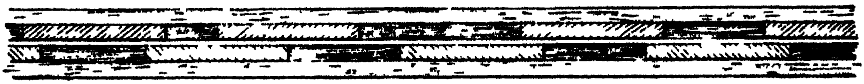


Fig. 196 Plan showing Disposition of Doors on Shutters in Grooves

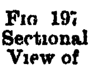


Fig 197 Sectional View of Grooving

meal, using two outer members A and B, 2 inches by $\frac{1}{2}$ inch, two members C and D, 1 inch by $\frac{7}{8}$ inch, and one member in the middle namely, E, 2 inches by $\frac{1}{4}$ inch. Thus the width of the grooving will be $\frac{1}{2}'' + \frac{7}{8}'' + \frac{1}{4}'' + \frac{7}{8}'' + \frac{1}{2}'' = 3$ inches. The central member E should be made of some tough wood, such as ash; but if no ash can be got, good white deal must do. Still it is better to have E in as tough a wood as possible, to avoid any mischance by fracture. Screw the grooving to the upper piece as at A in Fig. 194, which is screwed to the rafters, and the grooving below to the floor.

357. When the shutters are made, they must be slipped into the grooving from the open end, and disposed as shown in Fig. 196. The manner of working them will be easily recognised, and, indeed, one is shown partially open in Fig. 195. The advantage of the shutters is that they can be pushed all together at front and back, to make an opening of any size at any part. When the shutters are put into place, the triangular opening at either end, as the case may be, or at both ends if necessary, must be closed by triangular panels, made to fit the open space. To give the attic a light and pretty appearance, the shutters in one case and the doors in the other, may be painted of a light colour to suit the paper, or finished with Gypsoline, which serves as well to coat and colour wood as it does plaster.

Shutters, etc.

Panels at ends.

358. I trust I have helped the home carpenter to occupy his time in useful work about his house in early summer mornings and darksome winter evenings for many a month to come, nay, more, for many a year. Looking back in memory over all that I have already written, I find I have been guilty of a breach of promise in omitting to tell him how he may make a serviceable bevel for home use: so I will end this, the First Part of *Home Carpentry for Handy Men*, by showing him how he may do so In Fig. 198 *a* shows the bevel as seen from above, or in plan from above *b* as seen from below, and *c* side elevation with blade pushed out and raised In each portion of the diagram, A and B are the side pieces which are continuous from end to end, about 12 inches long, $1\frac{1}{2}$ inches wide, and $\frac{1}{2}$ inch thick, C is the blade of the same length, but only $\frac{1}{4}$ inch thick or $\frac{3}{16}$ inch, which will be thick enough. This piece is cut in a slanting direction at the end, and the part cut off is inserted between A and B, at D, for the slanting

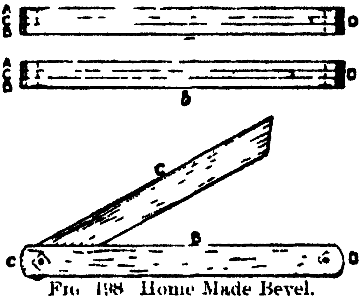
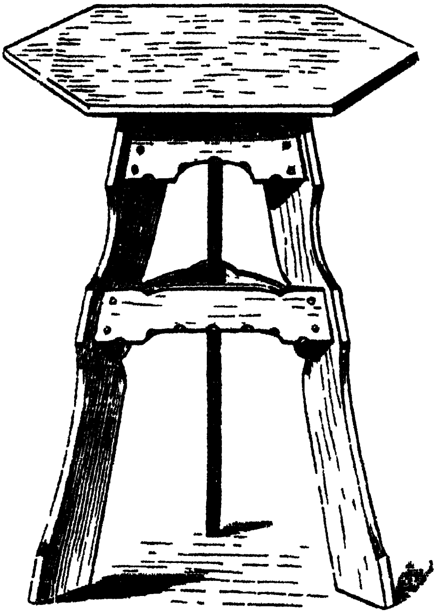


Fig. 198 Home Made Bevel.

The bevel: how to make it.

end of the bevel to rest on when the blade is closed. A metal pin is put through both ends and riveted on a thin piece of sheet metal at each end, let into A and B as shown in *c*. The blade is opened by pushing it up from below. The home-made bevel will prove a most useful tool to the amateur carpenter, as serviceable indeed as any metal one that can be bought. The blade should move tightly between the pieces that compose the stock, so that it may not shift readily when in use The tool should be made of mahogany, or some hard wood throughout.



Occasional Table

HOME CARPENTRY FOR HANDY MEN.

PART II.

Carpentry for the Garden.

If you would seek us
We are yours in the garden. Shall's attend you there?
—Winter's Tale, i, 2

CHAPTER I.

SOME WORDS ON OUTDOOR WORKSHOPS IN GENERAL, AND A REMOVABLE WORKSHOP IN PARTICULAR

Introductory—Tools and Appliances—About the Workshop—Its Warming—Furniture of the Workshop—Bench and Sawing Stool—The Sawbuck: its Construction—Adaptation of Sawing Stool for cutting Arris Rails—Construction of Sawing Stool—Removable Wooden Buildings—Lean-to or Span-roof—Basis or Foundation of Workshop—About Levels: their various Forms and Uses—Plumb Level—The A Level—Straight-Edge and Spirit Level—Foundation for Workshop—Concrete: What it is—Piers as Main Foundation—Mould for Piers—Mode of making Piers—Platform on Piers—Halving and Bolting together of Timbers at Corners—End of Corner Post: how reduced—Bolting Ends of Framing together—Getting all Parts ready before Fixing—Posts at Corners—Dimensions and Setting Out of Front of Workshop—Nature of Construction of Building—Construction of Panels—Frame—Boarding of Frame—Construction of Panels shown by Diagram—Preparation of Parts of Framework—Boards and Slips on Framework—Wall Plate—Insertion of Nut for Coach Bolt—Securing Corner Posts—Preparations for Putting in Panels at Back—Attachment of Framing and Panels by Bolts—Bolting up—Attachment of Panels at Top and Bottom—Lining for Workshop

Introductory.

359. IF the home carpenter has a garden, it may be looked upon as an absolute certainty that he desire and determine to make or to build something therein that will be either ornamental or serviceable—probably both; and that if he once makes a beginning with this sort of thing, he will go on and elaborate and multiply his work until it assumes an aspect that will give it individuality, and impart a character to it that will distinguish it from other gardens owned by neighbours, whether close at hand or at a little distance. Personally, I have done, and still hope to do, a great deal in this way; and it is now my aim and object in describing much that I have

done to assist the amateur artisan who owns a garden and loves it, with hints, suggestions, and ideas, which may be turned to good account, and worked and moulded to suit the circumstances and position in which he finds himself and the surroundings that he has about him. There will be much that is hypothetical in the pages that follow, for gardens are by no means stereotyped in form; and in writing a book of this kind supposition must perforce predominate; and I must write generally, for it is alike impossible and impracticable to write so as to meet the exact and precise requirements of every individual reader.

Tools and appliances.

360. Tools and appliances I have spoken of elsewhere,[*] and to the best of my belief I have named and noted everything that is needful, and even more; for in garden carpentry, as may be supposed, the articles that are needed for the work are neither so many in number nor so nice as those that are wanted for carpentry and joinery within doors; so, as a natural consequence, the less is included in the greater number, even as Euclid tells us as a truth axiomatic, which nobody can deny, that "the whole is greater than its part". So we need not trouble ourselves any further about things of this sort here; and I will content myself, and, I trust, satisfy my readers, by saying that if there be anything else that it is desirable to call into requisition, I will describe it at the proper time in its proper place.

About the workshop.

361. I must, however, say a few words on workshops in general; and this brings me to the actual commencement of the subject in hand without further parley. I have already shown, in Part I. of this work, how and where workshops may be extemporised in the house; but experience has shown me that the home carpenter's workshop, if he can by any possibility contrive that it shall be so, is far better and more convenient for every one concerned, if it be without and beyond the limits of the house proper, that is to say, the dwelling house. There are more ways than one of managing this. If there be any outhouse or outbuilding in the garden, it may be adapted, either as a whole or in part, to the requirements of the amateur artisan without very much trouble; but in doing this, as I have said before, the occupant must in its adaptation be guided by circumstances. The first thing to be done is to see that it is windproof and rainproof, and if it is not so, to make it so. The second thing is to see to its warming, which

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[*] See Part I., Chapter III., in which all tools and appliances absolutely necessary are described.

may be effected to a certain extent by means of oil or gas in apparatus especially made for the purpose by Rippingall & Co. and other makers, but preferably by such stoves as the "Gheber" Heating Stove, Roberts's Improved Patent Portable Terra-cotta Stove, the Columbian Stove, and other similar apparatus, in which anthracite or Welsh smokeless coal or coke from the nearest gas works, mixed with cinders from the house, may be burnt. I call attention to this, because an enthusiastic wood worker will, without doubt, spend much time in his workshop, on cold winter nights as well as warm summer days; and it is by no means pleasant to do this without some means of counteracting the cold. And there is another thing which no amateur who takes care of his tools will think lightly of, and that is, the prevention of damp, which in our changeable and ever-changing climate causes rust on iron and steel, by the combined action of the oxygen and hydrogen in the air, giving the amateur the work of cleaning and brightening up his tools, and thus causing delay in going to work, and a needless consumption of valuable time, which might have been devoted to work if he had resorted to warming his workshop by any other of the heating appliances above named. A genuine workman cares more about the condition of his tools than for his own personal comfort, without doubt; but when he can secure both by one and the same line of procedure, he may as well think a little about himself, as well as about the articles that he owns and uses.

Its warming.

Furniture of the workshop.

Bench and sawing stool.

362. If there is no outbuilding or shed in the garden that can be converted into a workshop, the next best thing that can be done—and possibly, after all, the best thing that can be done—is to build one; but we will come to the building part of the business presently. Meanwhile I will make a few remarks on the furniture of the workshop, which, when cut down to the barest proportions, means a work bench with bench vice at the side, and, if practicable, one at the end, after the manner of the beechen benches from the country of the Black Forest, a couple of sawing stools, and one if not two, with a good tool chest or chest of drawers for tools, or a series of drawers or boxes, in which tools can be grouped and put together in accordance with the kind of work they have to do, and to which I have already called attention in Part I. of this volume. About the bench, I need say nothing here, nor need I linger in describing a sawing stool and the purposes for which it is used, beyond saying that it is desirable to have two, because the two together will often be found most convenient as trestles, so to speak, on which to place large pieces of work when fitting the parts together, or when finishing them off after

putting them together: but the sawbuck I have as yet said nothing about; and as the home carpenter will find it useful for many purposes, from cutting up logs for fuel in winter, to holding and retaining wood in a proper position for ripping down diagonally from arris to arris, I will describe it here.

The sawbuck: its construction.

363. The principle of the sawbuck, its general construction, and the purposes to which it may be put, will be clear to the amateur wood worker from a glance at Fig. 199, in which it is shown in end elevation. A and B are two stout pieces of timber, say 2½ inches or 3 inches square, which are halved together *at right angles* at C. These pieces should be about 30 inches in length, certainly not less than 27 inches, and should be halved together near the upper ends, leaving the projecting horns from 6 to 8 inches in length from the upper angle of junction, C representing the lower angle. The lower ends of the timbers are cut across diagonally at an angle of 45°, so that the whole structure when put together will stand square and solid on a broad basis, which imparts to it that stability and immobility which is so necessary in an appliance of this kind. The St Andrew's Cross, to a certain extent, although the arms are not equal, is firmly screwed together at the halved joint above, and further strengthened below by a strong brace at least 1 inch thick, but better a little thicker, say from 1 inch to 1½ inches, screwed on firmly to the outer surface, as shown in Fig. 199, or to the inner surface, it does not matter which. No halving should be resorted to here, as halving always weakens the wood by one half, or to the extent of its reduction in thickness at the joints. Two of these crossed pieces must be made exactly of the same size and of the same proportions. The brace D should be about 3 inches in width. Now prepare four strips of wood, E, F, G, H, each about 2 feet in length, 3 inches wide, and 1¼ to 1½ inches thick, and having placed the two crossed pieces in position, connect them by means of these strips firmly screwed to the crossed pieces in the places indicated. Pieces of wood, whether round or square, may then be laid in the rectangular hollow between the horns at A and B for sawing into logs or short lengths. Wood to be ripped down diagonally to form arris rails or three-

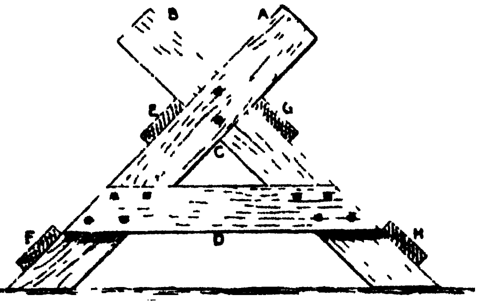


Fig 199 End Elevation of Sawbuck

sided rails for palings, may easily be sawn through from end to end on the sawbuck; but to do this would be found a matter of difficulty without it, unless three sided pieces be laid from end to end of one of the sawing stools, as shown in Fig. 200, and firmly screwed thereto; but this involves both time and trouble, and can only be regarded as a temporary arrangement, subject to removal of the arris pieces as soon as the rails are sawn up. Fig. 200 will give the amateur wood worker the key to the construction of the sawing stool, if there be any who do not know how it is made, which is highly probable. So, for the assistance of those who do not, I will briefly describe it.

Adaptation of sawing stool for cutting arris rails

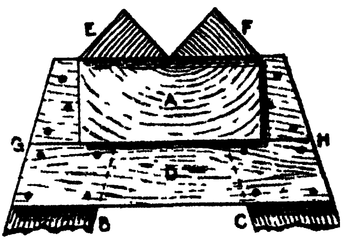


Fig. 200 Arris Rails placed on Sawing Stool.

364. In Fig. 200, A is a stout and solid piece of timber, about 2 feet or more in length, 6 or 7 inches wide, and 3 or 4 inches deep. This is supported on four stout legs, two of which are shown in the end elevation presented to the reader in the illustration, notched in the inner sides of the upper ends for the reception of A, to which the legs are firmly screwed They are set a little back from the end of A to admit of their connection by a wide brace as at D, which may be notched to receive A, and is then firmly screwed to the legs. The brace may be cut as shown, or a wider one than that which is shown below the line G H may be merely screwed to the legs below A without notching, thus affording a stronger mode of construction. If a wide piece be used as a brace below A, there is no necessity to put another lower down in the position of D at Fig 199; but if D be narrow or notched, as shown in the illustration given in Fig. 200, it is better to do so. The stool is completed and further strengthened by screwing on two stout strips from leg to leg on the outer surface, as shown at F and H in Fig. 199. It is not usual to make sawing stools as heavy and as solid as shown in Fig. 200; but if there be any intention of utilising the sawing stool in the manner shown, A must of necessity be wide enough to receive the two arris pieces E and F in the manner shown. Otherwise, a piece of wood about 4 inches by 3 inches is big enough for the stool itself, and the legs and braces may be smaller in proportion. I strongly advise the home carpenter to make his sawing stools or trestles of the ordinary size; and in his spare time, if he have any, to make for himself one or two sawbucks as well, as the pair come in very useful as supports for a long and heavy piece of timber which it may be neces-

Construction of sawing stool.

sary to saw into short lengths with a cross-cut saw before cleaving the lengths into logs. Moreover, lighter stools are more easily moved from place to place. If the amateur wood worker decides on making for himself a heavy sawing stool of the kind shown in Fig. 200, it will be decidedly better for him to screw to the legs a wide brace butting against the block of timber shown at A, along the line G H; and if he likes the look of the notched piece, to give the semblance of notching by screwing pieces of wood of the same thickness as that which is used for D to the tops of the legs above the line G H, dowelling these side pieces to the main lower piece D by wire nails.

Removable wooden buildings.

365. Touching the workshop, if the home carpenter has a convenient shed or outhouse that he can convert into a workshop, by all means let him do so; but if he be obliged, pocket permitting, to build a wooden shed for himself, I will show him how to do it, in such a manner that it may be easily taken down and removed if he quit the premises at any time. The amateur wood worker must always bear in mind that owners of property let to occupants as tenants can and generally do claim buildings and structures of all kinds, whether they be greenhouses, workshops, or even sheds, whose supports, be they of what kind they may, enter the ground and are fixed therein. Therefore, I will try to show occupiers as tenants how they may avoid this sort of thing, and save their property for use in another place, by putting up framed buildings, which can be erected and taken down at any time for removal with comparatively little trouble.

Lean-to or span roof.

366. Let us suppose we are bound to go on supposition that the home carpenter who desires to put up a workshop, requires a building, say 12 feet by 9 feet internal measurement, from wall to wall. I say *internal* measurement, because the external measurement from outside corner to outside corner each way will be more than this. It will in fact be 6 inches more each way than this, that is to say, as will be seen presently, the external measurement will be 12 feet 6 inches by 9 feet 6 inches, or even a little more; but this will depend entirely on the size of the posts that will be used at the four corners. The first thing for the would-be workshop builder to decide on is whether he intends to have a lean-to or a span roof building, and in this he must be influenced by the position in which the workshop is to be placed. For example, if he wishes it to stand back with its back against the wall of the adjoining house or a high garden wall, it may be a lean-to or span roof, but preferably a lean-to, because the lean-to will stand with its length against the house or wall, while a span roof *must* stand with its end against the wall; and although in round numbers the wall space

occupied by the span roof will be 3 feet less than that taken up by the lean-to, yet it will project further into the garden by 3 feet. A span roof may occupy a position in any part of the garden, or in a corner formed by the meeting of two low garden walls. Nevertheless, one thing must be borne in mind in either or any case, and that is, that the wooden shed or shelter to be used as a workshop must be an independent structure, that is to say, having every one of the four walls of wood; for if the back were omitted in the case of a lean-to, or one end in the case of the span roof, such building must be attached to the wall against which it stands, and it could no longer be regarded as a tenant's fixture, and would at once pass into the ranks of the irremovables. In either case the method or principle of construction in each kind of building is the same, the only difference being in the lean-to, that the back must of necessity be higher than the front; whereas in the span roof the actual walls will be of the same height all the way round, neglecting the gables at each end, which need not be taken into account.

Basis or foundation of workshop.

367. And first of all, let us consider the nature of the basis or foundation of the workshop on which the superstructure is to be raised; for this is the key to the construction, and will explain at once *why* the building, if I may use so ambitious a term for our wooden workshop, is in good faith a tenant's fixture and removable, or, to put it with greater precision, is absolutely removable, and therefore a tenant's fixture. If you put a log on the ground in any part of your garden, the landlord or owner of the ground cannot under any possibility lay claim to it. It does not matter how small or how large the log may be: the very fact of its being not fixed in the ground as a post would be, renders it your property and yours alone. If you choose to have the trunk of a forest tree drawn into your garden at any time, if it were worth while to do so, you could remove it at any time and no one could say nay to its removal. Again, if you laid a piece of timber on the top or along the top of a wall belonging to your landlord, whether large or small, you can remove it at pleasure. And similarly, you can remove any number of pieces of wood that you may have fastened together in any way, no matter what the length or breadth or height of the concatenation of pieces of wood thus fastened together may be. If you put up a brick wall or wall of concrete, having its foundation sunk below the surface of the ground, that without doubt belongs to the owner of the ground on which such wall is built; but until the component parts of the wall, be they bricks or stone or gravel or brick rubbish or mortar or cement, be laid *on* the ground without connection, they are yours; and you are free to deal

with them as you please, that is to say, to build with them or cast them away.

About levels their various forms and uses

368. We are going to put up a workshop, about 12 feet 6 inches by 9 feet 6 inches external measurement, and about 6 inches less each way internal measurement, and it is a *sine quâ non* that that building must stand on level ground; so a site for the workshop, say 13 feet by 10 feet, must be cleared and levelled. To make sure that a post or upright is fixed in a truly upright position, you apply a plumb level to the four sides of the post in succession, if it be a square or flat-sided one, and thus test its perpendicularity; and a plumb level has been described in Part I. of this volume at page 165; but to save the trouble of reference I give here in Fig. 201 an illustration showing its use in this respect, and this will also exhibit its construction. In this the plumb level is applied to the side of the upright C; and if the cord B A, to which the plumb bob A is attached, and is inserted in the central nick B at the top of the level, coincides with the central line grooved in the wood or strongly marked with a pencil from top to bottom, the post C is upright on that side at all events, and if it bear the test on all sides it is set truly upright.

Plumb level

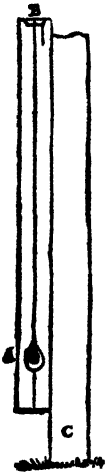


FIG. 201 Plumb Level

369. In levelling ground, however, and determining the true level of a flat surface, means altogether different are used, and the appliance which is here called into requisition for determining the accuracy of any horizontal surface, whether levelled ground, or the top of a wall or surface of a wall, at any part of its uprising, is known as an **A** level from its shape, which bears a strong resemblance to the letter A. This is shown in Fig. 202, which fully explains its manner of use. The principle of the **A** level is precisely the same as that of the plumb level, and it may be regarded as an extension of the plumb level to admit of its application to horizontal surfaces, as it is to vertical surfaces in its simpler form. A plumb level shorter than that which is used for vertical surfaces is set in the middle of a straight-edge from 5 to 8 feet in length, as the plumb level C D is shown in Fig. 202, to be set in the centre

The A level.

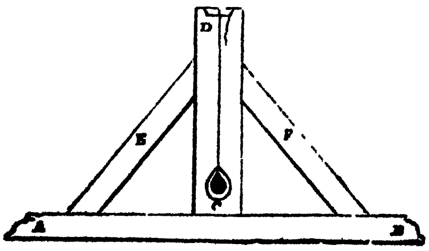


FIG. 202. The A Level.

of the straight-edge A B, and at right angles to it. Furthermore, the two pieces thus put together by a mortise and tenon joint, for which the home carpenter may substitute a halved joint, so long as the jointing is accurately done, are strengthened, and rigidity and immobility imparted to the whole structure by means of braces, E and F, which impart to the level the appearance from which it derives its name. The accuracy of the levelling of a piece of ground is tested by applying the **A** level to it in different parts here and there, when, if the string C D coincide in all cases with the line drawn or grooved down the centre of the vertical part, it may be taken as well and truly done; but if the plumb bob and string incline to the right or left of the line C D, the rising or depression as the case may be must be reduced or raised.

370. There is another ready mode of determining the accuracy of ground levelling, and that is by means of a straight-edge, G H, L K, about 8 feet in length, 4 inches wide, and ⅞ or 1 inch thick, planed up with the utmost accuracy along its surfaces G H and L K, which are thereby rendered truly parallel. The straight-edge, as shown in Fig. 203, is then placed on the ground, and a spirit level, M, is placed on the upper edge. It shows that the points A, C, E, F, on which it rests, are in the same horizontal plane, or, in other words, are on a level one with the other; but a glance along the lower edge K L shows that there is a long depression at B, extending from A to C, which must be filled up, and smaller hollows at D, and between E and F, which require the same treatment. Neither the **A** level nor the straight-edge and spirit level will determine the accuracy of the levelling beyond their own length, but the correctness of the work may be fairly well tested by the application of the level in different directions.

Straight-edge and spirit level.

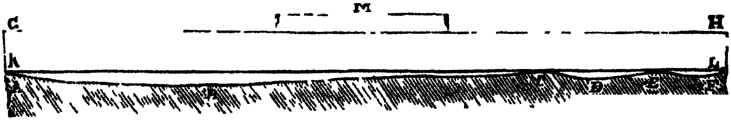


FIG. 203. Straight-edge and Spirit Level as Ground Level.

371. When the space to be covered by the workshop is levelled and cleared by means of the spade, the surface should be well beaten to render the ground as solid as possible, and a space 13 feet by 10 feet should then be pegged out, each side being truly at right angles with the adjacent sides, and an inner oblong should also be pegged out, which may be just 14 inches from the outer oblong on every side. This is shown in Fig. 204, in which A, B, C, D, represents the outer line, and E, F, G, H, the inner line. Now, there are various ways of making the foundation, and the

Foundation for workshop.

home carpenter must make his own selection, and thereby please himself. First of all, a trench may be taken out all round between the lines, and this may be filled with brickwork or concrete, or brick externally and internally, bonded by a cross brick here and there, and having the interstices or spaces between the bricks filled with concrete. I have omitted to say that Fig. 204 is on a scale of ⅛ inch to 1 foot: a small scale, it is true, but large enough for the present purpose. A foundation entirely of bricks, or of bricks and concrete intermixed, would form what is known as "a brick and a half wall"; that is to say, a wall 1½ bricks in thickness, or 13½ inches thick a brick being 9 inches long, 4½ inches wide, and 2½ inches thick.

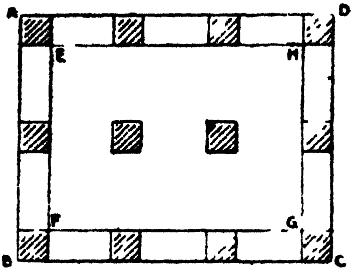


FIG. 204 Foundation for Workshop.

Concrete: what it

372 Another way is to dig out the trench, and then fill in with concrete, which may be defined as a mixture of cement and sand, gravel, broken stones, brick rubbish, or any similar material, mixed together in the proportion of five parts of hard material to one part of cement or good lime, with water sufficient to bring the whole of the ingredients together into a thick mass. Cement is better than lime; and if lime be used, it should be used with cement in equal proportions. Fill the trench, then, with brick or concrete till it appears above the level of the ground, and then see that the surface is truly level by testing it with the **A** level or straight-edge and level in various places. But bear in mind that a foundation thus made cannot be removed, and must be left where it is. The maker thereof has, nevertheless, one consolation, and that is, that it is not worth removing, for many reasons which must be obvious to all and therefore need no explanation.

Piers as main foundation.

373. I will, however, show the home carpenter a better and more profitable way of going to work, by which he may make even his brickwork and his concrete his own; and this will speedily solve the mystery of the shaded blocks which the reader has, as a matter of course, noticed, and perhaps wondered at in Fig. 204. In Devonshire, and possibly in many other parts of England, ricks of hay, and mows of wheat, barley and oats are often raised on piers, footings or pedestals resembling truncated cones about 2 feet in height, and having a broad flat stone at the top. The idea is partly to keep the corn from the ravages of mice, and partly to keep the ricks from the damp ground. On these piers beams are laid in one

direction, traversed by cross pieces in the other; and on the platform thus made faggots and brushwood are laid, and on the top of this is piled the hay or corn, as the case may be. It is far oftener done in the case of corn than with hay. Now, the shaded blocks in Fig. 204 represent piers which are to be used as a main foundation for the superstructure, and these piers are to be made artificially, and are to stand each by itself on the bare ground, which, as I have said before, must be beaten and rammed in order to render it as solid as possible.

374. But before we go any further, I must try to show you how these piers may be made; and in order that they may all be of the same size they should be made in a mould or box. I have shown in Fig. 205 the kind of box that should be used as a mould. It consists of four sides that are held together by staples fastened into the ends of two opposite sides. These staples are passed through mortises cut near the ends of the adjacent sides. The ends—as we will call them for convenience sake—*a*, *a*, are each 14 inches by 7½ inches by 1 inch; the sides *b*, *b*, are 18 inches long, but of the same width and thickness, and the bottom is 18 inches long, 16 inches wide, and 1 inch thick. The sides and bottom are made to project 1 inch beyond the ends, that better security may be given against fracture where the mortises are cut to allow of the passage of the staples. It is necessary to make the mould in this manner, so that it may be taken to pieces all the more easily and readily when the piers are dry and ready to be turned out. It is useless to make it after the manner of a box, that is to say, to nail sides, ends, and bottom together, because the piers might not admit of withdrawal, at all events, without much trouble in some cases; and then, again, the weight of the material forbids any attempt to turn the mould over for the purpose of dislodging the piers by turning them out.

Mould for piers.

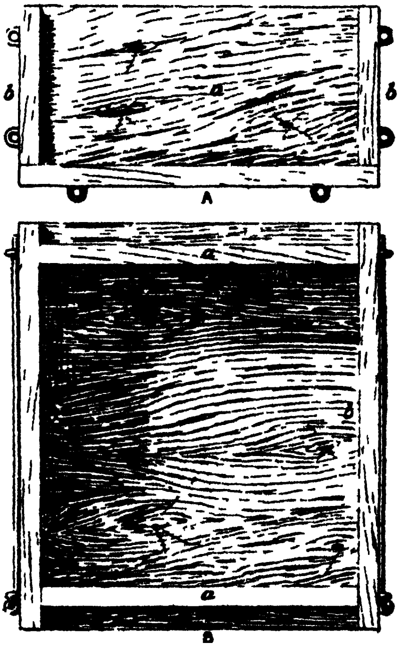


Fig. 205. Wooden Mould for Piers A. Side Elevation: Exterior B Plan looking down on Interior

Mode of making piers.

375. In making a pier with concrete the mode of procedure is easy enough. The materials are mixed together and thrown into the mould, and the top is levelled and brought even with the sides and ends of the mould. When the stuff is set hard, it is taken out and put on one side to dry. Any holes or interstices that may show themselves in it may be filled with a little fresh cement and smoothed over, thus giving it an even face every way. Brick piers require to be built up within the mould, and as indicated in Fig. 206 in plan at A and in elevation at B. The letters *a*, *a*, in each indicate the position and arrangement of the first layer, which must be set in cement, plenty of cement being placed between the sides and ends of the bricks. The enclosed space at *d* is filled in the first layer with a half brick set in cement. The second layer is arranged as shown at *b*, *b*, the dotted lines showing the divisions between the four bricks thus lettered that form the exterior of the layer. The opening above the first half brick, *d*, in the first layer, and the four bricks in the second layer, should be filled with cement. Every brick should be plunged in water before being placed in position. Complete by a third course, *c*, which is placed in the same manner as the bricks at *a*, *a*, the opening at *d* being closed up by a half brick, as in the first layer, placed on the layer of cement in the very middle, and bedded in cement. There will be a little shrinkage as the block dries; but as the shrinkage will be the same on every pier thus made, it will make no practical or appreciable difference in actual size. When the twelve piers are ready for transfer to the place where they are to stand, place them in the relative positions shown in Fig. 204.

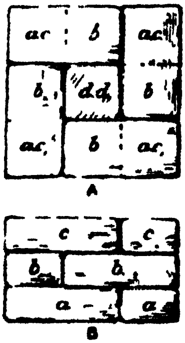


FIG. 206 Brick Pier in Plan (A), and Elevation (B)

Platform on piers.

376. Before proceeding any further, we must remember that the outer measurement in Fig. 204, against which ten out of the twelve piers have to be placed, is 13 feet by 10 feet, and that our workshop, external measuremen , has to be 12 feet 6 inches by 9 feet 6 inches, or less than the outer line of the piers by 3 inches in every direction. The piers themselves are 14 inches square, or very nearly so; and in order to make a platform to rest on these piers, we must get two pieces of timber, 8 inches wide, 4 inches thick, and 13 feet long; and two pieces of timber of the same width and thickness, but 10 feet long. These should be halved together at the corners; and when all that is necessary in the way of preparation is done, they should be laid on the outer edge of the ten outer piers in such a manner

that the outer sides of the piers and the outer sides of the timbers placed on them are in the same vertical plane. I can best show my meaning by giving, as I do in Fig. 207, a diagram of the elevation of one of the piers at a corner of the building and a corner of the framework above it This diagram, for the sake of clearness of detail, is on the scale of 1½ inches to 1 foot. From this the reader will see how the timbers are halved, and afterwards bolted together at the corners, and how they are mortised at the junction to receive the corner posts of the building, which are 4 inches square; and as the beams that form the framing laid on the piers are 8 inches in width, it will be evident at once that in the square formed at the halving and junction of the timbers, there will be a margin round the exterior of the post, 2 inches in width. In order, however, to weaken the framing at the junction as little as possible, the end of the post is reduced on all sides to the distance of 4 inches from the bottom by sawing off on all sides a piece ½ inch thick, which has the effect of making the tenon at the bottom of the post 3 inches square instead of 4 inches square, as the upright itself is This reduction is indicated by dotted lines both in Figs. 207 and 208. It has the advantage, moreover, of forming a shoulder whereon the post rests on the top of the framing when the tenon is placed in the socket cut to receive it, which imparts additional solidity and immobility to it. The tenon should fit closely in the mortise, but not so closely as to require driving in; for, in all probability, it will swell a little through damp, and this might bring about a difficulty in getting it out when the building is taken to pieces for removal.

Halving and bolting together of timbers at corners

End of corner post how reduced

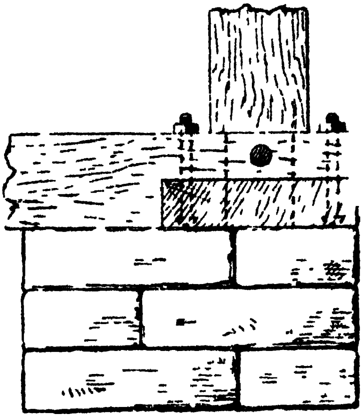


FIG 207. Elevation of Brick Pier and Corner of Framing laid on it

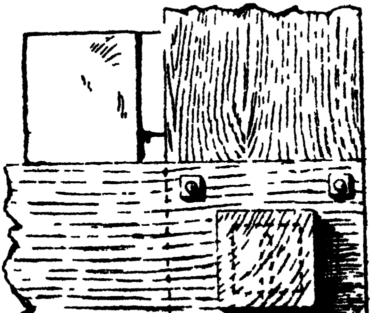


FIG 208 Plan of Brick Pier and Corner of Framing laid on it

377. I may as well explain here the manner adopted for bolting the ends of the framing together. The bolts used should be 4½ inches long and

Bolting ends of framing together.

⅜ inch thick. In all probability, 4-inch bolts would do; for it is desirable that the ends of the bolts should not project to any appreciable distance beyond the nuts that are put on to the ends, when the framing is subsequently firmly fixed by screwing up the bolts If the head of the bolt should be ¾ inch in diameter, a recess should be made in the lower surface of the undermost timber, about ½ inch deep with a ⅞ inch centrebit. This will cause the head of the bolt in every case to be drawn up into the wood, and so prevent the obtrusion of the head, which would prevent the settlement of the framing upon and close to the surface of the pier in all parts as it should do. Thus, if the bolts were 4 inches long, as the framing itself is 4 inches in thickness, the entrance of the head to the extent mentioned would still give ½ inch of the threaded end of the bolt projecting beyond the upper surface of the timber, which would be sufficient for screwing up. At the last a provision will be made for projecting the nuts and ends of the bolts from the action of the weather. Do not omit to smear the ends of the bolts well with grease before screwing up.

Getting all parts ready before fixing.

378. Practically speaking, the framing should not be finally put together and fixed before every part of the house is ready, and then all the bolting up may be done together; but everything should be got ready, and the holes drilled for the bolts, and every bolt tried in place. The ends of the timbers that are to come together should be marked to correspond, and the uprights marked also, both in reference to the mortises in which they are to be dropped, and the outward faces of each; and the bolts should be tied together in fours as fitted for each corner, so that there may be no chance of anything being mislaid or lost, which would tend to cause delay and confusion when the work of fitting together is reached.

Posts at corners.

379. With regard to the four main posts at the corners of the building, it has been said that they are to be 4 inches square. The height of the walls, so to speak, of the workshop need not be more than 6 feet from the framing, if the builder of the workshop considers that this is sufficient. I think, however, that the height of the workshop should be placed at 6 feet 6 inches, or even 7 feet; and it will be as well to cut the posts at least 6 inches in excess of the height determined on for the walls of the workshop, as any amount necessary can be taken off afterwards; but addition by scarfing or any other means is a matter of some little difficulty, and occasions extra labour and delay.

380. And now we must go a little into figures in explaining the manner in which the house is to be built. The length of the timbers at front and

back was placed at 13 feet. Therefore, supposing the line exhibited in Fig. 209—and which, although the parts are in due proportion, is not drawn to any settled scale—represents a length of 13 feet, the subtraction of the projection of the timbers 2 inches beyond the outer surface of the posts, as shown at A and A′; and the width of the posts themselves, as shown at B and B′, being 4 inches, making in all 2″ + 4″ + 4″ + 2″ = 12 inches, leaves the length of the intermediate part between B and B′ equal to 12 feet, which may be divided into 4 spaces of 3 feet each, or six spaces of 2 feet each, if the builder prefer to do so, for the reception of panels of the same width. I prefer to have four panels, 3 feet in width, as shown at C, D, E, F, and I will base further description on this supposition. The home carpenter has now the key to the entire construction of the house, which I have, I fear, been some time in bringing about, but which is now in his hands; and let us further place the height of the workshop at 6 feet 6 inches, to save further delay in description.

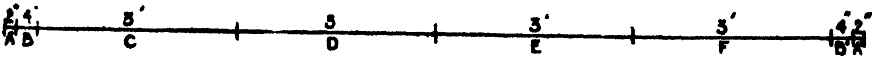


FIG. 209. Diagram showing setting out of Front of Workshop.

Dimensions and setting out of front of workshop.

381. By a similar mode of reasoning and measurement as that which has been pursued in the last section, and which is applicable to the front and back of the house, the ends will consist of three panels, each 6 feet 6 inches high and 3 feet wide, in the same manner as the front of the house will consist of four panels of the same height and width. The construction of the walls is therefore applicable to a span roof or lean-to house alike. The gables and anything above the mere walls and the wall-plate by which they will be surmounted may be left for the present until the construction and connection of the panels has been described. But here I may note that the extreme length of the house at front and back being 12 feet 8 inches, and the extreme width at the sides 9 feet 8 inches, is no very great departure from the original estimate of 12 feet 6 inches for the external length, and 9 feet 6 inches for the external width; and this has been brought about by the substitution for strength's sake of corner posts, 4 inches square instead of 3 inches square, as I originally intended. So we shall want now four panels for front and back, and three panels for the sides; in all, fourteen panels for the walls of the house, and these may be reduced to twelve if the home carpenter decide on having a door at each side of the house, which he will find convenient. The description of one panel only will be enough for the whole, with a modification of the panel for lighting the interior of the

Nature of construction of building.

house. The builder can, of course, place the doors wherever he pleases to suit his convenience, and the circumstances of position and otherwise under which the house is built; but I recommend him to extend the lights along the entire length of the front of the house, and to have the doors in the centre of the sides, for reasons that will appear presently, as ventilation may be obtained by the doors, or by means of lights hung on pivots or hinges in the gables, or in other ways that will readily suggest themselves.

Construction of panels. frame

382. Our panels then are to be 3 feet wide and 6 feet 6 inches in height *outside* measurement, that is to say, *including* the framing; and the first thing to be done will be to procure a quantity of quartering, 2 inches by 2 inches, —we will say this for facility of description, although quartering generally runs 2 inches by 2¼ inches; but as this extra ¼ inch will be used in depth and not in width, that is to say, *vertically* and *not horizontally*, it will make no difference in point of construction, and the trouble of accounting for quarters of inches will be saved. The first thing, then, to be done in making a panel will be to make a frame, 6 feet 6 inches by 3 feet, outside measurement, mortising and tenoning the parts together at the corners, or connecting them by halving as the home carpenter pleases. For the sake of strength and accuracy, the pieces of the frame should be cut 6 inches longer than they are to be when the frame is finished, and, in the case of halving, notches cut at the ends, leaving short horns projecting after the manner of an Oxford frame, the horns being cut away when the parts of the frame are all ready and it has been screwed together. Our frames are to be covered, not with weather boarding, or feather-edged boarding as it is also termed, but with vertical boarding, which will run from top to bottom of the panel; whereas weather boarding is put on horizontally: so for the fixing of these boards we shall want horizontal pieces of quartering notched, or mortised, according to the principle of jointing adopted, into the frame from side to side. In an ordinary panel to be boarded over from top to bottom three of these will be sufficient, but the home carpenter may use four if he pleases. If he determines on using three only, the aggregate width of the framing and cross bars will be 2′ × 5 = 10 inches, leaving four openings between; and as the height of the panel is 6 feet 6 inches or 78 inches, this less by 10 inches gives 68 inches as the aggregate width of the openings, and this divided by 4 gives 17 inches as the distance between cross bar and frame at top and bottom, and cross bar and cross bar. I put it in this way to show the amateur how, by the simple use of a few figures, he may regulate his measurements without playing about

too much with his 2-foot rule. I always get at my measurements in this way. Stiffness may be imparted to the frame by notching in diagonal braces from the back.

383. So much for the skeleton of an ordinary frame; and now for the integument or wooden skin with which it is to be covered. As the panel is 3 feet wide, four 9-inch boards will accomplish the covering over quickly and exactly. The joints of the boards should be concealed by strips of wood, bradded on over them from top to bottom. These

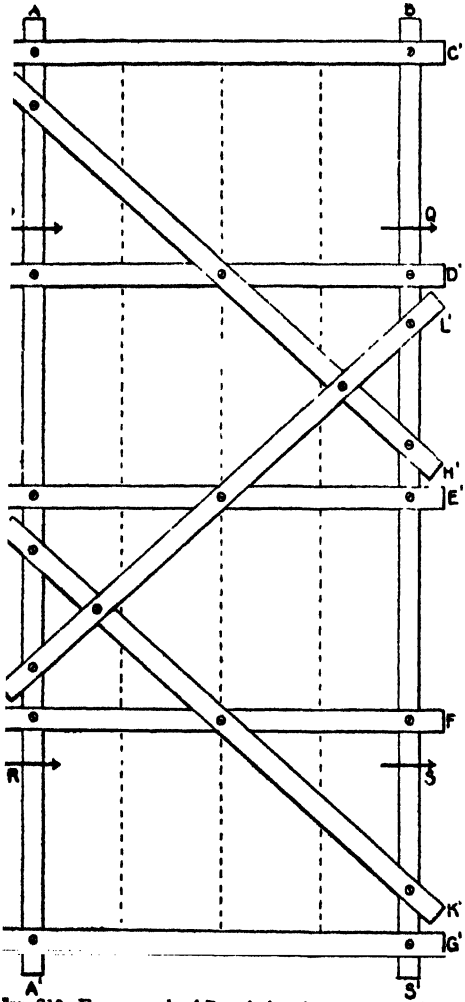


FIG. 210. Framework of Panel showing Construction.

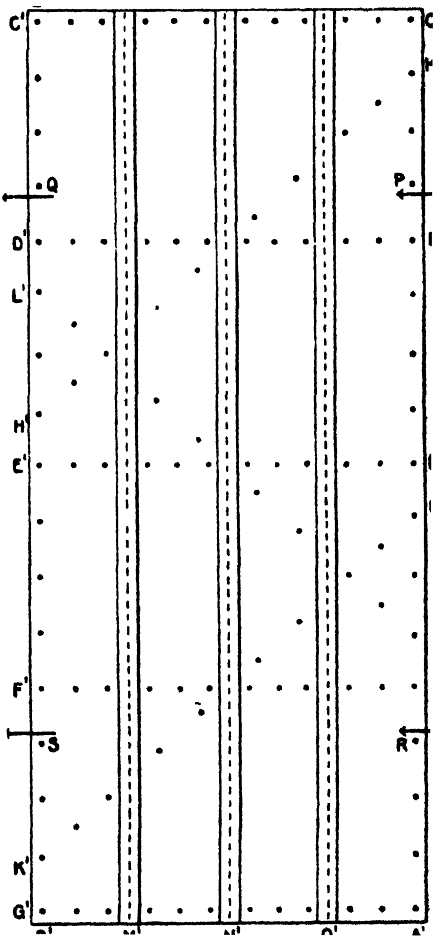


FIG. 211. Panel complete with Horns removed.

Boarding of frame.

external boards may be from ½ inch to ¾ inch in thickness, as the builder pleases, but boards ⅝ inch thick will be substantial enough. The slips to hide the joints in case of shrinkage and to prevent draught, etc., or any unsightly appearance resulting from defective edges, should be about 2 inches wide and ⅜ inch thick; but for reasons to appear presently they should not be put on until the panels are set in their places.

Construction of panels shown by diagram.

384. At this point, however, it occurs to me that the unskilled amateur carpenter, who is ambitious enough to try to build himself a workshop, may wish to have the construction of a panel put before him by diagram as well as by description; and as this will serve as a lesson in carpentry for carrying out many other kinds of framing besides that of a panel for a removable workshop, I may as well—nay, better—do this than leave it undone; so in Fig. 210 I have sought to show him how the skeleton or framework of the panel is best made, and in Fig. 211 I have given a panel in its complete form. For the general utility of a knowledge of framing, suppose the subject of amateur theatricals came to the front, and some scenes and wings were required for the Theatre Royal, Back Drawing Room. Well, with Fig. 210 before him, and a few battens, 2 inches by 1 inch in width and thickness, any one might soon put together all that is necessary for the support of simple scenery with practicable doors and windows as well as side wings and a proscenium into the bargain, if needful. I have shown these on a scale of ¾ inch to the foot, because if rendered on a smaller scale the details of the notching would not be so palpable.

385. Now, in Fig. 210, A A′ and B B′ are the uprights or styles, two in number; and C C′, D D′, E E′, F F′, and G G′, are the five rails. It will be fresh in the recollection of every reader that the framework of the panels is made of quartering, which we assume to be 2 inches square, and that the space between rail and rail is 17 inches. Having made our measurements with accuracy, and marked the places at which the styles are to be notched with square and pencil, and defined or marked out the depth of the notches, which is 1 inch, with the marking gauge, we proceed to cut them *bare*, leaving the pencil marks showing, with a tenon saw, carrying the saw cut down the line scored along the sides by the marking gauge. Remove the parts to be taken away with a sharp chisel, doing the work of removal gradually and carefully, and watching the direction of the grain lest the bottom of the notch be too deep on one side, as shown in Fig. 212; so in cutting a

Preparation of parts of framework.

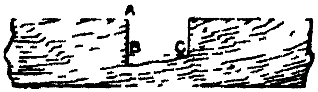


FIG. 212 Notch badly cut owing to direction of Grain of Wood.

notch, ascertain by trial at the top the way of the grain, and then work accordingly, taking the wood out with the chisel as far as B, as it will split away in an upright direction from A to B, and then clear the rise at C by working gradually with the chisel from B towards C. Having cut out all the notches in A A′ and B B′—there are five in each of them—lay these pieces on one side, and cut the necessary notches, the five rails, C C′, D D′, E E′, F F′, G G′, marking them in the same way. Fit every rail into its notches in the styles as you proceed, and mark each rail, numbering them 1, 2, 3, 4, 5; and mark the notches in the styles with the corresponding number, until the styles and rails are all fitted together. Then lay on the styles and rails the diagonal pieces H H′ and K K′, and mark the edges of the notches on the styles A A, and B B, and the rails D D′, and F F′. Cut out these notches, and having fitted the diagonals into them, mark on the diagonals the corresponding notches by which they are to be halved into the styles and rails just named. Then pursue the same course with regard to the last diagonal L L′, halving this into the two styles, the central rail E E′, and the diagonals, H H′ and L L′. This completes the work of fitting; and the parts should now be put together on the bench, tested with the square, and then screwed together with 1¾-inch screws, No. 10, or even 1½-inch screws of the same number, countersinking each screw hole, so that the head may be let in below the level of the wood.

Boards and slips on framework.

386. The dotted lines in Fig. 210 indicate the places occupied by the 9-inch boards when the framework is turned round to receive them, as shown by the reversal of the lettering in Fig. 211. Nail on the two outer boards, and, if necessary, spring the central boards in between them, and complete the nailing down. To make sure that the nails are driven into the framework, mark the central lines on the horns that are still projecting, and draw lines in an upward direction on the edges of the outer boards; and draw from point to point lines to correspond with the central lines of the different pieces of quartering that compose the framework. You cannot then fail to put the nails in the right places, and to drive them in with regularity. Use 1½-inch cut nails; do not drive the nails down level with the surface of the wood itself, lest you should bruise and dent it with the hammer, but finish the driving in of each nail with hammer and punch; and after the first coat of paint has been put on, fill up the holes with putty. The dotted lines in Fig. 211 indicate the junction of the boards; but these are finally hidden by the slips M M′, N N′, and O O′, which are not to be put on until the panels are all in place along one part of the house, whether front or back. Lastly, trim off the horns.

387. Let us assume that the back of the house will be composed of panels in full, such as I have been describing; so we will proceed to complete the back of the house at once, which will show us how the front is to be put in and finished, and the ends also to a certain extent. First of all, we must have a wallplate running right round the house from post to post. To this we shall want four pieces of timber, two of them 13 feet long, 4 inches wide, and 2 inches thick; and two 10 feet long, and of the same width and thickness Mark off 6 inches at each end of each of these pieces, so as to leave 12 feet exactly from mark to mark in the longer boards, and 9 feet exactly from mark to mark in the shorter boards. Halve the ends to the marks recently made as described, and cut the posts off accurately to the height of the panels, namely, 6 feet 6 inches from the timbers on the piers. Lay the pieces that compose the wallplate on the posts, and having marked the centres, as shown in plan (1) at A in Fig. 213, bore with a ½-inch twist bit a hole right through the wallplate, and about 6 inches in depth, down the centre of the post. With a centrebit a recess should be made from ¼ inch to ⅜ inch depth in upper wallplate at A, to receive head of coach bolt, which is to be passed down the hole made through the wallplate, and down the post as far as the nut which has been inserted in a square mortise cut for its reception, about 3 inches below the top of the post, as shown in section (2) at B. When the bolt touches and enters B, it is screwed down with a square key or wrench fitted for the purpose, until it binds and holds the ends of the wallplates and the posts firmly together. The insertion of the nut in the post for the reception of the threaded end of the coach bolt and its retention is altogether a nice one. Its position should be accurately marked on the top of the post, after the hole through the wallplates and into the posts has been bored with the twist bit; and from this marking lines should be drawn to the edges of adjacent and contiguous sides, and down the sides themselves, so as to determine the extent and depth of the hole to be cut for it with the utmost precision. When the extent of its depth has been nearly reached, the nut should be inserted from time to time, and tested from above until its threaded hole is directly under the hole, or rather across the hole, made by the twist drill; and when it is ascertained that the coach bolt can be put in and drawn out of the nut with

Wallplate.

Insertion of nut for coach bolt

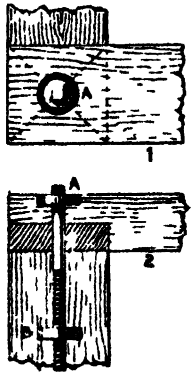


FIG 213 Connection of Wallplates and Corner Posts with Coach Bolt in Plan (1) and Section (2).

comparative ease, the opening should be filled up to keep the nut in place. As the posts are not fixed, they can be easily taken out and laid on the bench for the cutting of the mortise.

388. We will now take it that the posts are all set in place and finally held from withdrawal by a couple of large screws, inserted as shown in Fig. 210 and Fig. 211, in which the screw entering through the upper wallplate is indicated. Another screw is inserted in the same way through the lower wallplate. A hole is first bored about ¾ inch deep, by means of a centre-bit and brace, large enough to admit of the easy passage of the screw, and the hole is afterwards stopped. Notes of all these points should be made by the builder and hung up in the workshop, lest the position of the screws escape his memory, and the taking down of the workshop, prior to removal, be rendered a matter of difficulty. Further we will assume that the wallplates are now firmly fixed to the tops of the corner posts by the coach bolts; and this main framing being completed, we may proceed to put in the panels in the back.

Securing corner posts.

389. It will be remembered that the corner posts were set back 2 inches from the edge of the timbers on the piers, which timbers, for the sake of brevity, we will call the platform. Stretch a line from face to face of the posts, and make a mark either by means of chalk or charcoal, applied to the line itself, or draw a strongly defined pencil line. Get out a strip of wood, or take a piece of quartering 13 feet long, or a trifle longer, so that it may project a little beyond the length of the platform. Cut recesses in it to permit its fitting down securely over the nuts at outer corners of the posts, as shown in Figs 210 and 211; bevel the upper surface of the quartering until it assumes the form of a slight slope throughout, from the inner upper edge, and screw this down securely to the platform. The outer face of this slip will be in a vertical plane, coincident with the vertical outer face of the platform, and the back will form a lodgment against which to butt the panels and to keep them truly aligned, or in other words adjusted in line. For the same purpose, nail a strip of wood temporarily to the face of the wallplate, about 3 inches wide. Use wire nails, leaving as much of the nail projecting as possible, so that it may be easily withdrawn with the pincers.

Preparations for putting in panels at back.

390. Having got thus far, put the panels into their places. If the work has been accurately done throughout and according to measurement, they should fit in well enough; but very likely there will be a little adjustment required here and there, and that this will take the form of some slight

reduction of the sides of the framing of the panels here and there by means of plane or chisel. We will assume that all is right so far, and that the panels are in place. Now measure *downwards* from the line of contact of the wallplate, and the top of the post, 16 inches, and measure the same distance *upwards*, from the apparent line of contact of the platform and the bottom of the post. Do this on both sides, and having made the necessary marks on the posts themselves, stretch cords from one post to the other, and mark with care the points in which the cord crosses the junction of the panels. The points will be just where the panels and framing in Figs. 210 and 211 are crossed by the arrows, P, Q, R, S. Take out the panels and return these marks on the edges of the framework, return them also on the posts, and then with brace and a ¼-inch bit bore holes through posts and sides of framing of panels for the reception of ¼-inch bolts. Before boring through the posts, make a deep recess in the sides of the posts into which the heads of the bolts can be drawn when screwed up. Do this with a centrebit of sufficient size. The boring of the holes for the bolts will be best done with a twist bit of the proper size, as the centrebit will not be long enough. This part of the work must be exactly and accurately done. I am afraid the home carpenter will approach this part of the job with fear and trembling, and I will suggest to him that he should gain confidence in himself by practising on a few odd pieces of quartering before he enters upon the greater and more important task.

Attachment of framing and panels by bolts.

391. Let us hope, however, that the work of perforation has been accomplished without mishap, and that the holes from posts to panels and from panel to panel are in direct coincidence throughout. The bolts being now in readiness,—6-inch bolts for posts and panels, and 4½-inch bolts for the panels,—commence by inserting two of the longer bolts through the holes in the first post and first panel, after smearing the bolt itself, and especially the screw thread at the end of each bolt, with grease to secure an easy passage and an equally easy withdrawal when necessary. Put the nuts on the ends of the bolts, which are now protruding on the *inside* of the framing, and screw them up as closely as possible with a wrench, drawing post and panel closely and tightly together. Now do the same with the first and second panel, the second and third panel, and the third and fourth panel, and lastly, with the fourth panel and opposite post. Then you have the back of the house in place, firm, strong and rigid,—a good reward for the work done, and the care and trouble and labour expended in doing it.

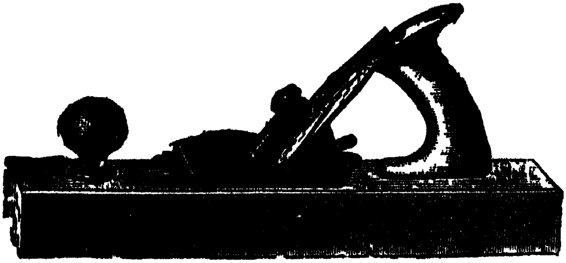
Bolting up.

392. Something more, however, yet remains to be done in securing the

panels, but this is by no means so difficult a matter as that which has been done already. Through the bottom of the framing of each panel two 3-inch screws should be put to draw the panels and the piece of quartering that has been screwed down to the outer edge of the platform, closely together, and after recesses have been duly made for drawing in the heads of the bolts, a hole should be bored with the twist bit through the top of wallplate and framing of each panel, through which a bolt must be passed through from the top, and then screwed up. It will be noticed that the nuts of the bolts and the heads of the screws that are inserted along the bottom, are all inside the house or workshop, and in the case of the nuts inside the quartering that forms the framework of the panels. By this arrangement it is all the less a matter of difficulty to unscrew the nuts and release the bolts if any occasion arise to take the workshop to pieces for removal. It will remain for the builder to decide whether or not he will have any lining to his workshop, that is to say, boarding over the interior of the panels. If so, he should get matchboarding, and put it up horizontally or vertically as it pleases him; but it will, I think, be better to place it vertically, although, if placed horizontally, it may be applied in 12-feet lengths, extending from post to post. It must be put up with screws; and as few screws as possible should be used, for it must all be taken off before the work of taking down the house can be entered on. It gives a neat appearance to the interior of the workshop, at all events, although it is by no means essential to its utility.

Attachment of panels at top and bottom.

Lining for workshop.



Stanley's Wood Jack Plane

CHAPTER II.

SOME WORDS ON OUTDOOR WORKSHOPS IN GENERAL, AND A REMOVABLE WORKSHOP IN PARTICULAR—*(continued)*.

Chalk Line and Reel How to use it—Windows for Workshop—Modification of Panels for Front of House—Windows in Front of House—Window Sill—Fixing Window—Windows How made—Mode of making Windows to Open—Opposite Doors in Sides of Workshop—Closing up Sides—Pitch of Roof—Supports for Removable Roof—Post and Ridge Board—Rafters—Mode of Finishing Roof—Completion of Structure without—Suggested Arrangement for Doors—Spacing out Floor of Workshop for Joists—Preparation for Bedding and Fixing Joists—Bevelling Ends of Joists—Piers for Ends of Joists—Floor Boards and Door Sill—Workshops of a Permanent Character—General Principle of Construction—Hints, etc, on different Parts of Workshop—My various Workshops—The Ground the Workshop occupied—First Steps—The First Phase—The Second Phase—Additional Fencing—The Third Phase—Roof of Workshop and Plant Shelter combined—Construction of Roof of Workshop—Completion of Workshop

393. In the preceding chapter I have mentioned the carpenter's line, but I do not think I have said anything about the forms that it takes and the mode of application. In its simplest form it is nothing more than a large reel with a line wound round it, as shown in Fig. 214, but there is a neater form consisting of two turned discs, connected by a central axis, as shown in Fig. 215, which is more convenient for the pocket. Its cost is but small, not more than 1s., if so much, and every home carpenter should have one. The cord, to do its work effectually, should be non-elastic. In Fig. 215, an example is given of its use. It is required to saw the board, A, B, C, D, in half, or to cut a piece off one side of it, and E F shows the line of division along and through which the saw must pass. Insert a fine bradawl at E, and having rubbed the line with a piece of chalk or charcoal, tie it to the bradawl by a knot and loop. Then insert another bradawl at F, and, straining the line as tightly as possible, tie it by another knot and loop to the bradawl at F. Then, lifting the cord

Chalk line and reel how to use it

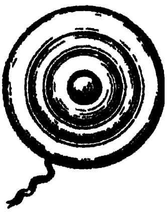


Fig 214 Reel for Line.

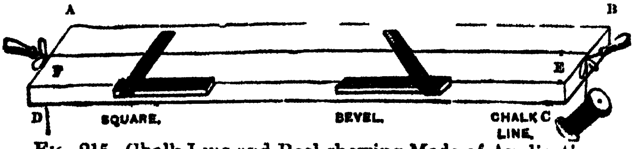


Fig 215. Chalk Line and Reel showing Mode of Application.

with thumb and finger, release it suddenly and it will strike the board sharply along its entire length from awl to awl, leaving a white or a black mark on the board from E to F, which is a perfectly straight line, and indicates the mark along which the saw cut should be made. If the same be done on the other side of the board, and the board be turned from time to time during the process of sawing, it will show the sawyer whether or not he is holding the saw upright and making the saw cut truly and uprightly, and in the proper direction.

394. With regard to the lighting of the house, there are many different modes of doing it. For example, it may be lighted from the front, or by windows at the sides, or by skylights placed in the roof and acting as part of the roof. Even the gable ends may be glazed as a means of lighting the house, if it so please the builder of the workshop. If he makes practicable windows, as they say in theatrical parlance, that is, windows that will open and close, he must have casement windows which are hung to the sides of the framing by hinges. I will show him how to make a casement window presently. In this case he will require a modification of the framing of the panel in which the window is to be put, and indeed in any and every panel that carries light there should be, and must be, some modification. I recommend him, however, to light his workshop from the front, and to place his bench immediately under the light. I would also carry the lights right along the front of the house from post to post. Further, he may have glazed doors. Again, especially if the gable ends front east and west, he may fill them with glass as well as the doors, and so get the benefit of the sun on cloudless days in the morning and in the evening. In all cases, the windows should be made independently of the frames, and screwed into place against the frames, so that they may be taken out and placed on one side during the taking down of the house for removal.

Windows for workshop.

395. Supposing it is decided to light the house by a range of windows along the front; referring to Fig. 210, and supposing further that the diagonal braces are not yet put on, notch in the rail D D′ in such a manner that there is a depth of 9 inches from the *top* of the rail C C′ to the bottom of the rail D D′. The rails and the space between them can then be covered in externally by a piece of 9-inch board, placed horizontally from style to style, and the slips can be simulated by nailing short pieces to the exterior of the board. Then make the spaces between the rails E E′, F F′, and G G′, 18 inches instead of 17 inches. This will leave a space of 27 inches between the rails D D′ and E E′. Strengthen the lower part of

Modification of panels for front of house.

the panel by one diagonal brace put on after the manner of K K′. The space of 27 inches is thus accounted for. The height of panel is 9 feet 6 inches, or 78 inches, then 78″ − (9″ + 2″ + 18″ + 2″ + 18″ + 2″) = 78″ − 51″ = 27 inches. No diagram is needed to show this, as the amateur can easily follow my description.

Windows in front of house.

396. We have, then, as window space to be filled up in each panel an opening 32 inches in width by 27 inches in depth. Let 2 inches out of the 27 be taken up by a window sill, 4 inches wide and 2 inches thick, extending from post to post, including the posts. Notch this wherever it crosses the uprights of the panels to the depth of 2 inches, so that the inner half may rest on and be screwed down to the rail E E′, and the outer half project for 2 inches beyond the front of the house. Draw a line along the sill coincident with front of the house from post to post; and from this line bevel it down to the extent of ⅜ inch or ½ inch, so that the rim may not settle and be retained on it. We have then a space of 32 inches by 25 inches as window space. The front of the window when completed will present the appearance indicated in Fig. 216; but before describing its formation, it may be as well to say that as the window will fit into the opening left for it in the panel, and as the front of the window will be flush with the framework of the panel itself, provision must be made for holding it in its place by screwing slips of wood, 4 inches wide, and, say, ¾ inch thick, to the rails D D′, E E′, and to the styles between these rails, against which the window may be butted. Screws will then be inserted from within, through the slips and into the framing of the window, to hold it securely in position. The portion of the framework uncovered between the boarding above and the boarding below must be masked with a slip of wood to correspond with boarding; and the window may then be finished on the outside by bradding a ⅜-bead all round to boarding on the top and sides and at the sill. The beading thus used must correspond in width to the thickness of the boarding.

Window sill.

Fixing window.

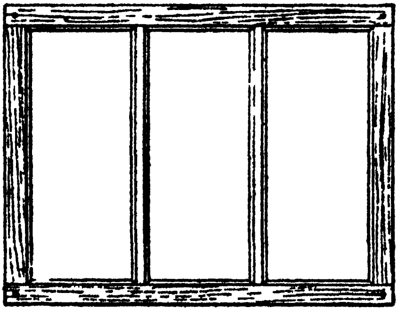


FIG 216. Window for Panel of Workshop.

397. We now come to the method of making the windows. First make the frame of four pieces of quartering fastened together, and notch them together with projecting horns, as recommended for the framing of the panels.

Windows: how made.

Then prepare two slips of wood, ½ inch or ⅝ inch in width and 2 inches wide, and halve them into the frame from behind. The front of these slips will be flush with the front of the framing. Then get out some slips of ¼-inch stuff or ⅜-inch the former will be quite wide enough for the purpose—and ⅞ inch in width. Nail or brad these slips round the three openings in the frame, bringing them flush with the inner surface of the framing. When these are in place, you will find that you have a capital rebate into which to drop the glass, without the trouble of working it in the frame, and the uprights notched into it. Before putting them on, dress the sides, top, and bottom of each opening with a coat of thick paint, preferably white. If the slips notched into the window frame be ½ inch in thickness, which is wide enough, you will find that the panes of glass will be 21 inches long by 9 inches wide, because 25″ − 4″, the joint width of the upper and lower parts of the framing = 21 inches and 32″ − (4″ + 1″) width of sides of frame with combined width of the slips notched into the framing = 32″ − 5″ = 27 inches, and this divided by 3 gives 9″, the width of each pane. Having these panes in readiness—twelve will be required for the four windows—paint the rebate, and when nearly dry, put some putty on the rebate only, and then drop in the glass, pressing it firmly on the putty, and thus pressing out any redundancy of the material, which can be cleaned off at any future period. Then secure the panes in place by bradding beaded stops over and touching the glass to the sides of framing and intermediate slips. This will complete the making of the windows.

Mode of making windows to open.

398. The windows thus made are, as I have already pointed out, fixed windows. If the home carpenter wishes to have them so as to open, he must attach them to the framing of the panels by hinges at the top or at one side in the usual way; and then nail stops ¾ inch square or thereabouts round the framing on the inner edge. The stops, however, should correspond in thickness with that of the boarding used to cover the panels. This will bring the outer part of the framing flush with the surrounding boarding, attached to the rails and styles; and the hingeing must be made to the edge of the boarding, and to the framing to which it is screwed, casement window hinges, otherwise "butt" hinges, being used. In this case, however, it will be better to make the window frame smaller by 2 inches each way, and to put a lining of 1-inch stuff round the opening, equal in width to the combined width of the boarding and frame to which to hang the window. An eye must then be screwed into the lower rail of the window frame within, and a stay be fixed outside to keep the window in

position when opened. I do not, however, recommend the home carpenter to have windows to open in this position, but to fix them as described.

Opposite doors in sides of workshop.

399. The opening between the posts on each side of the building is, as the reader will remember, just 9 feet. If he determine to have only one door, he must close up one side with three panels, made in the manner already described. He will, however, find it convenient to have two doors, one on each side, opposite to each other. These he may place in the centre or adjacent to front or back, as he pleases; but for general purposes they had better be in the centre. My reason for having two doors, and those opposite doors, is this: that if a man has some long boards boards that are considerably longer than his workshop to cut up, he can do so, and at the same time keep within his workshop. To be sure, if he be cutting the board into short lengths, he can have one end outside, even with a single door, and bring more of the board within as each short piece is cut off; but suppose, on the other hand, if he be ripping a long board down to make a V shoot or gutter, he could not do it and still keep within his workshop if he had only one door. Again, suppose he were planing up a long board, either wide or narrow, he could not manage it either on edge or surface without two opposite doors; and when engaged in work of this kind he could, at all events, move his bench into the position most convenient for his purpose, and support the ends of the board as he brought them along, either on trestles the height of the bench, or on slips of wood temporarily screwed to the jambs of the door frame, bench height, or in case of planing up the edge of a board, to the height of the bench vice.

Closing up sides.

400. But how he will arrange as to having two doors or one, and if two, as to the position in the sides that they shall occupy, must be left to the home carpenter himself, who will best be able to judge and determine according to his own requirements. All he will have to do in closing up sides will be to have two panels covered throughout, or with windows, as described in detail above: and then in the remaining opening to put up jambs, at all events, and a lintel and sill if he likes; although the wallplate will serve the purpose of the former, and the platform that of the latter, and to hang the door to one or other of the jambs thus put up. Enough has been said about the making of doors in the First Part of this work, so no further reference need be made to their construction here. The front, back, and sides filled up, the only parts that now remain to be dealt with are the gable ends, the roof, and the floor.

401. The form of the gable ends will depend entirely on the pitch of

Pitch of roof.

the roof, although, whatever this may be, its construction will be the same; but before entering on this, it will be better to consider and determine the pitch of the roof. The greater the pitch of a roof the quicker the rainfall is carried off; but as our roof must be made in sections, it will be undesirable, as I will show, to carry it to any excessive height. The combined height of platform (4") panel (78") and wallplate (2") will be 84", or 7 feet. Now, if we carry the height of the ridge in our span roof to 5 feet, although the sides of the roof in this would be very nearly a right angle, giving an excellent fall for speedily carrying off the rainfall, yet it would be excessive, as the diagram given in Fig. 217 clearly shows. We had better place it for the span roof at 3 feet 6 inches, and in the case of the lean-to at 4 feet; but if the amateur attempt to make a lean-to shed on this principle, he should let his roof consist of a double row of panels, so managed by putting on pieces on the upper part of the rafters to raise them to a level with the lower series of panels, preserving the same inclination as a matter of course, so that the lower edge of the upper course may lap over and rest on the upper edge of the lower course. The only alternative in the case of a lean-to is to make the workshop narrower, and therefore cause the roof to be of less weight. It is wiser, however, to confine the lean to form to permanent buildings, and to adopt the span roof in the case of any structure made to be removable.

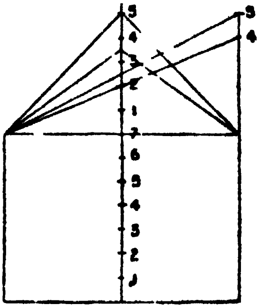


FIG 217 Pitch of Roof.

Supports for removable roof.

402. To make a permanent roof is easy enough, but to construct one that is removable is a matter of some difficulty, as we must first provide some kind of support on which to lay the panels, of which the roof will be composed, and to get the exact slopes at which to bevel the edges of the supports; and first of all we must have a ridge board in place, and manage to furnish a support first. To do this, take a piece of timber 4 inches by 3 inches, and connect it with the wallplate by mortise and tenon in the same way that the posts were let into the platform; but for security's sake, halve the end in the direction of its width and to the depth of the wallplate, cut away the front half and, leaving the back half, drop the tenon thus made into a mortise 3 inches long and 1½ inches wide, reducing the tenon to these dimensions by taking ½ inch off, on each side of it. This central post should be 3 feet 3 inches in height, including the tenon. One of these posts will be wanted at each end. Cut a notch ⅝ inch wide and 3 inches deep in the

lower edges of these slips, and the slips over wallplate and panels at front and back, should be on a level throughout. Finally, a skirting board, about 4 inches deep and ⅝ inch thick, should be screwed to the bottom of the panels all along at front, back, and sides; and when this has been done, the slips concealing the junction of the boards of the panels may be put on; but this has been purposely left to the last, because the upper edges of the skirting boards have to be bevelled, and the ends of the slips cut inwards on the level, so as to fit exactly on to the skirting boards.

406. As I have said before, the home carpenter will well know how to put up the jambs and lintel of the door. It will be a good plan to arrange them in the form of a frame with a door-sill in addition, and to fasten the entire frame to platform and wallplate, letting the jambs project slightly, say for ½ inch at top and bottom, and grooving them into platform and wallplate. The doors will be made and hung in the usual way. This done, the exterior may now be painted or treated in any way suitable for the preservation of the wood work that the builder may consider advisable. Thus he may go over the exterior with stain and varnish, if he likes; but he will find it, I think, better to paint it. This may be done even before setting about the floor, which must now be considered.

Suggested arrangement for doors.

407. Referring to Figs. 207, 208, we are reminded that the entire length from pier to pier, outside measurement, is 13 feet at front and back, and the extreme width 10 feet. The platform is 8 inches in width; so deducting twice this width from the outside measurement both ways, we have for the length and width of space within the platform 11 feet 8 inches by 8 feet 8 inches. This we will call the joist room, that is to say, the space in which we have to lodge our joists to carry the floor boards; and we must bear in mind that it will be necessary to keep the upper edges of the joists on a level with the surface of the platform. The joists, furthermore, will run across the width of the building, and the floor boards along the length. Now, good substantial joists used in building are usually 7 inches in depth or width, and 2½ inches thick; and the space between the joists is usually put at 12 inches. We have to dispose our joists over a length of 11 feet 8 inches, or 140 inches; and we shall want no joists at each end, because the inner edge of the platform on each side of the structure will do duty as joists. This being the case, the number of spaces to be left between the joists will exceed the number of joists required by one. Now, if we take 10 spaces at 12 inches each, and 9 joists at 2½ inches each, we

Spacing out floor of workshop for joists.

get spaces = 120 inches + joists = 22½ inches = 142½ inches, which is 2½ inches too much; but 2½ inches is just 104¼ inches: so if we reduce our space between the joists to 11¾ inches, we have our length of 140 inches disposed of with the utmost exactness.

408. We now come to the actual construction of the floor, over which we must be very particular, in order to ensure stability. Were there any bearing for the ends of the joists, as is usually found in the walls in which they are placed, it would all be plain sailing: but it so happens that there are no walls, and hence the difficulty which must be got over. At this point a plan of the floor will be helpful, and I have given half of it in Fig. 219, leaving it to the home carpenter to complete it for himself on the same scale, which is ⅜ inch to 1 foot. In this the

Preparation for bedding and fixing joists.

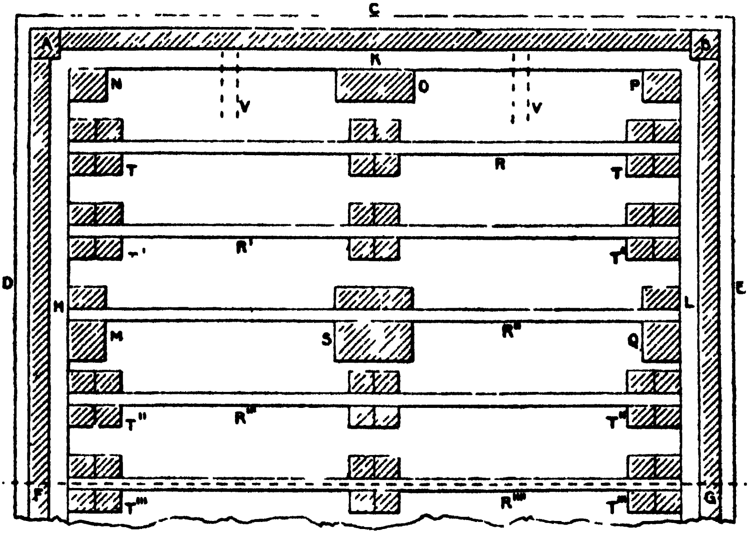


FIG. 219. Plan of Part of Floor showing Joists and Supports.

posts at two of the corners, A B; the 2-inch slips nailed down to the wall-plate outside for the panels to butt against, shown at C, D, E; the broad shaded part from F to G, taken right round from these points within and adjacent to the 2-inch slips, C, D, E; F, G, being the line that divides the floor in half; the inner and visible parts of the platform, H, K, L; and the visible parts of the brick piers, M, N, O, P, Q, on which the platform rests, are clearly apparent, and can be readily recognised. Now, what we have to do is to find a suitable lodgment for the joists running from front to back of the workshop, which are shown in place at R, R', R'', R''', and which must be cut full so as to jam tightly between the opposite parts of the platform. With regard to R″, the ends of which rest on the piers M and Q, and the middle on the pier S, these ends must be notched; and a notch 14 inches by 3 inches must be taken out in the centre, a piece 6 inches long and 3 inches deep being taken out at the lower part of the joist at each end. This will reduce the ends to 4 inches in depth for the length of 6 inches; and this is done to bring the upper surface of the joist R″ to a level with the top of the platform, which, it will be remembered, is 4 inches in depth, and which, at the same time, allows the ends of the joist to rest upon the top of the platform.

Bevelling ends of Joists

409. It would not be a bad plan, in theory at all events, to cut the ends of the joists on a bevel—if only a bevel of from ½ to ¾ inch throughout its depth—and to groove the sides of the joists as shown in Fig. 220, in which A is the platform in section, the shaded part showing the groove at B, the end of the joist inside elevation. If cut truly and of the exact length, each joist would drop into the grooves in the opposite parts of the platform cut to receive its ends, and being brought into the form of a wedge would, or ought to, go no further than sufficient to bring the upper surfaces of joist and platform on the same level. But, as the platform is not fixed in any way, and only remains in place by virtue of its own weight, I am by no means sure that in practice it would not give to the outward thrust of the joists; and if one joist were cut slightly longer than the adjacent joists, the pressure would tend to loosen the grip of the platform on the adjacent joists, and cause them to drop slightly below the level of the platform. But the suggestion made here may be useful and practicable in other cases, so I leave it to the consideration of my readers.

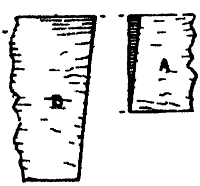


FIG 220 Bevelling End of Beam

Piers for ends of joists.

410. We will, then, leave the ends of the joists squared up. Now, it will be manifest to the dullest comprehension that the joists will require some kind of support at their ends, and we must find out some means of doing this. It will be remembered that the combined height of the large piers and the platform was 7½″ + 4″ = 11½ inches, and that our joists are 7 inches in depth, which leaves 4½ inches between the bottom of the joists and the earth. If, then, we make smaller piers of concrete or of four bricks cemented together, two bricks being placed one way in the direction of the breadth of the house, and two forming the *upper* course in the direction of the length, we shall get some substantial piers 9 inches square and 5 inches in depth or a trifle more, which we can place as

bearings under the ends of the seven joists that have no central pier to rest on, as R″ has. These piers on either side we may distinguish as T, T′, T″, T‴. These piers will afford sufficient bearing for the joists, as they are only 8 feet 8 inches in length, and are very rigid, owing to their depth. If the home carpenter have any doubt on the subject, and wish to make the stability of the joists secure and doubly sure, he can place intermediate piers in the centre of each joist, as shown in Fig. 219; but I do not think they will be in any way needed; and even the large piers, as shown in Fig. 204 and at S in Fig. 219, may be omitted; but certainly their place should be taken by two of the smaller piers. I may say it was to give strength to the joist R″, and the corresponding joist in the half of the joist plan not shown, that the large piers were introduced in Fig. 204. To me they were as a shadow cast before by the approaching event of consideration and arrangement of the joists. In order to bring the surface of the joists and platform to the same level with precision, the home carpenter may, if he thinks good to do so, run two lines of notches along the upper surface of platform and joists, just between the small piers, 2 inches wide and 1 inch deep; and screw a slip, 2 inches by 1 inch, into the notches throughout the length; but thorough testing with the **A** level or straight-edge and spirit level will be sufficient to show that they have been truly laid. If any of the small piers have a tendency to throw the joists upward, the removal of a little of the soil on which the pier immediately stands will counteract it.

Floor boards and door sill.

411. The joists being duly laid and tested, nothing more remains than to cover them with floor boards. The space to be covered in right up to the lowest framing of the panels is just about 9 feet, so, eighteen 6-inch floor boards, a trifle over 12 feet in length, will just about do it; but the home carpenter must remember that if he has not laid down a door sill, thinking that the absence of this member may be convenient for sweeping out the workshop, he must at all events put one in, projecting over the edge of the platform and finished off on the outside with a nosing. This sill should be cut from floor boarding so as to be of the same thickness with the floor. Nothing now remains but to put a step, or steps, before the door, or doors, as the case may be, and shoots at the back and front to receive the rainfall from the roof. The guttering may be of wood, in the form of a V, or of iron. The water should be carried earthwards by a down pipe and permitted to escape thence by drain pipes leading to a pit, which may be dug as a preliminary proceeding near the house and filled with brickbats and other rubbish. The rainfall will find its way into the interstices

between the bits of brick and stone thus thrown together, and gradually soak away into the surrounding soil.

412. There is nothing, I think, that I have left unsaid with regard to the removable and portable workshop. It has taken a long time to describe, and much space has been given to it,—two faults for which I trust to be forgiven, on the plea that from time to time many lessons have been dovetailed in on collateral subjects, which cannot fail to be useful to the amateur wood worker, and especially the unskilled hand, who needs all the guidance that can be given to him. With regard to workshops of a permanent character, their construction is far more simple. Four posts, one at each corner, connected at base with ground sill, if let into the ground sufficiently high to prevent contact with the soil, and finished below the ground sill with a gravel board and a wallplate at top, to connect them at top, affords the main framing. On a foundation wall, very low and but a few inches above the surface of the ground at top, and built of brick or concrete, on which a wallplate is laid; nailed down to wood bricks let into the uppermost course of the wall, into which wallplate the corner posts are mortised, with another wallplate connecting the posts at top, represents as before the main framing. Studs or uprights are let into the wallplate on the wall and the wallplate above at suitable intervals, and by means of these provision is made for doors, windows, and the material with which it is covered, which will in all probability be weather boarding, made by feather-edged boards, each in its turn overlapping the board below it. The roof may be made in the self-same way, and covered in with weather boarding, although it is a kind of roofing that I do not care for, as the boards are apt to crack and split at times under the drying influence of the summer sun. I prefer boards laid flat and covered with roofing felt, well dressed at least once a year with a coat of tar. This is the rough and ready style of doing things, and may be adopted by those who merely require a shed impervious to weather and have no wish to take it away with them.

Workshops of a permanent character.

General principle of construction.

413. A volume of some size might be written with ease on the various ways of building workshops, and the various means by which existing buildings, destined at first to serve other and widely different purposes, may be modified, altered and adapted to meet the particular requirements of the occupant; but it would have to be with an hypothesis or supposition of existing circumstances, which would influence modifications, alterations and adaptations. Enough, however, has been said in this and the preceding chapter to put the home carpenter in the way of

Hints, etc., on different parts of workshop.

putting up his own workshop from foundation to finish, if there be nothing in the shape of outhouse or even shed in the yard, garden, or grounds of the dwelling-house that he occupies. Various hints, suggestions and instructions as to different parts, such as windows, skylights, ventilation, etc., and accessories, some plain and some ornamental, such as barge boards of both kinds, and work in wood devised to imitate work in other and more enduring materials, will be found scattered here and there through this work, and that which is useful and appropriate in one case can be easily adopted and utilised in another. It is not possible on account of space, and moreover the reader might find it wearisome if I harped too long upon a single string; so, having given this hint as to the suggestions and instructions that will be found elsewhere, I will try to afford encouragement to the wood worker, who may be working under difficulties with respect to his workshop, or the want of one, by telling him how I myself have fared in this respect during my long years of experience as an amateur wood worker. When Admiral Byng was shot for alleged cowardice in 1757 when sent to relieve Minorca, then blockaded by a French fleet, because he hesitated to risk the loss of his fleet by engaging an enemy whose strength and fighting power were much superior to his own; some Frenchman who was endowed with considerable more wit than wisdom, said that it was done "to encourage the others". It is my sincere wish "to encourage the others," that is to say my fellow workers of all ages who may feel dispirited at the general conditions under which he has to tackle the work that he loves and enjoys, and to show him practically how everything seems in reality to come to him that waits and perseveres, even though the thing he so ardently desires be long in falling into his hands in the condition and position in which he would best like it.

414. I was always fond of watching carpenters at work as a boy, and I have spent many hours in carpenters' shops, insensibly, if I may use the term, gathering a knowledge of tools and their uses; and of the mode of carrying out many an operation in carpentry and joinery, without entertaining the slightest idea that the knowledge I then picked up could be of any use to me at a future period. In one of his novels, *Gilbert Gurney* or *Gurney Married*, I think,—it is years since I read them,—Theodore Hook puts into the mouth of one of his characters the following distich :—

Children pick up words, as pigeons peas,
And utter them again as God shall please.

And it was after this manner that I gained my ideas about and knowledge of carpentry, and brought them out of memory's storehouse eventually as occasion served. I may add that I was first induced to take up the work by finding that there were many things, such as glazed frames, etc., and other like appliances, which I could not afford to purchase, and must needs do without altogether, unless I bought the materials, and then made the various things I wanted for myself.

My various workshops.

415. No sooner did I begin work in earnest than I felt I had urgent need of a workshop. Since I began work as an amateur wood worker I have had a fair number, and have adopted more than one outbuilding to my purpose; but when I first started, I had no workshop whatever, and was obliged to content myself with an out-of the-way corner for my tools indoors, and work out of doors at anything I might take in hand, with no other appliance than a rough stool, which served to support any wood that had to be sawn up, and other incidental purposes. Things continued in this way for some years until I managed to get a house with a long and darksome shed in the garden, in which I managed to work at a small bench which I had managed to make out of a packing case. This was the first bench I ever had, and I can assure my readers it was a source of infinite satisfaction to me to find myself the possessor even of a small affair such as this was. My next workshop was a coach-house, which, with a small stable, ran under two rooms at a house in which I lived in a southern suburb of London. Then I had a smaller and darker shed than the first, and next, one that I built myself in the form of a lean-to against a house at the bottom of the garden of the house in which I then lived; and my last one, before I became the occupant of that which I now have, was one which may be said to have grown bit by bit. and which I will now describe, tracing its growth from absolutely nothing to its ultimate completion. In Chapter I. of the First Part of this volume I have touched lightly and briefly on the evolution of man; and I will now go, as lightly and briefly as may be, though necessarily step by step, through the evolution of a workshop, which possibly will prove far more interesting to some of my readers than the former subject. I feel constrained to do this, having said that this book will consist, to a great extent, of descriptions of various kinds of work and appliances, and different buildings that have been erected or made either by myself or under my directions.

The ground the workshop occupied.

416. The house against whose side this workshop grew was in reality a semi-detached one; though when it was first put up it was detached, and stood by itself. Later on a row of houses was run up, of which the first touched the side furthest from the workshop, and there was no other party wall between the two save the side of the house in

which I myself lived. This I ascertained by measurement and inspection when the adjoining house was empty for a time. But this was no longer a matter of wonderment to myself when I learnt that the row had been thrown together by "Poor Old Uncle," assisted, among others, by his excellent disciple, Mr. Gerribilder--both of whom were strict economists in what they were pleased to call building, and never wasted a brick or a board if they could help it. And surveyors were more indulgent in those days than they are now, and prone to wink at proceedings which they now watch with lynx-like eyes in some places, ready to pounce with proper severity on any hapless wight who endeavours to evade the law through respect to the profits by running the gauntlet of occasional though strict inspection. The ground my workshop ultimately occupied was 16 feet in length by 8 feet 6 inches in width, and was open at both ends, so that any one who would could pass through it from the front *en route* for the back door, and hold sweet communion thereat with the maids that ruled the roast and wielded broom and duster.

417. The first thing that I did was to hinder those pilgrimages of love by putting across the end that was nearest the road a fence with two panels, with a door between them, the whole surmounted by an ornamental cresting, which extended from the house to the other end of the fence, which butted against a low panelled brick wall that separated this part of my garden from a long narrow strip leading to the back door of the next house, which was occupied by the relieving officer for the Union district in which my house was situated. For some time this remained a garden ground. I do not describe the trellised fence, as I shall have to deal with trellises presently. All I need say is that it was 8 feet 6 inches long and 6 feet 6 inches high, and was of solid make and substantial character. It was put up for me by a carpenter who was so modest in his charges that for this and a few trifling jobs done in the house, he sent in a bill for no higher sum than £9 10s. 0d. When I demurred at the price, he, supposing me to be a fool, declared it was cheap at the money asked, and looked overwhelmed with astonishment when I said I should have the work measured up. I did so; and the surveyor, after stretching every point in favour of the carpenter, said he could make no more of it than £5. This Mr. Overreach meekly accepted, declaring that if he took work at such prices as I thought fair and right, he and his poor wife and little family would soon find their way into the Union. I retorted by observing that I thought it would be the other way, and that entrance to the Union would fall to the lot of those who were content to

First steps.

employ him at such prices; and here the incident ended. I need not say that I never made another attempt to assist Mr. Overreach on his way to the Union.

The first phase.

418. Presently a desire to keep fowls was developed in my household, and with the fowls some pigeons; so the low brick wall was surmounted nominally by wood work, consisting of boarding nailed to rails attached to posts set up on my side of the wall; so that the boarding, which consisted of stuff about 7 inches wide and ¾ inch thick—floor boarding, in fact,—just met the edge of the coping of the wall. I boarded up the other end in a similar way with rough boards from the wood yard put up longwise, and covered in the space that was now enclosed by the trellis on one side of the door, the boarding at the back, the boarding at the end, and wire netting disposed in long panels in front, one of them opening to give access to the run for cleansing and other purposes, with a glazed roof of trifling inclination, but inclined inwards towards my house, consisting of frames laid in short rafters, resting on the top rail of the boarding and the framing in which the panels were set. As the trellised panels were 3 feet wide, and the door was 2 feet 6 inches wide, and hung to the framing of the side panel nearest the house, this gave us a small fowl run, 16 feet long and 3 feet wide; the upper end of which, next the trellis, was fitted up as a small fowl house, with laying drawer to pull in and out, and roosting place below; the upper part of the enclosed space being so contrived as to make room for six pigeon boxes. I do not describe this in detail, because the construction of fowl houses belongs to another part of the volume.

The second phase.

419. Thus the germ fence had developed into a fowl run. We had eggs, and even a few chickens were hatched; and the pigeons we had, one blue and the other reddish brown, soon produced a pair, and then another pair of fantails was introduced, which multiplied exceedingly; but at last it was discovered that the odour which emanated from the fowl run was disagreeable to us as we passed in and out, the trellis door being used as the chief means of egress and ingress, to save trouble in coming in at the front door either by summons per knocker, bell or by latch-key. So it was decided to give up the fowls, and the wire netting and fittings of the combined fowl house were disposed of to a bricklayer in the employ of Mr. Gerribuilder, who in consideration thereof agreed to put a cement flooring over the entire area of ground, when called upon to do so. However, when the call was made he got a younger brother to help him, and brought in a bill for materials and his brother's time, observing, when I said I expected to

have had the work done without charge, that I could not expect him, a poor working bricklayer with a large family, to do more in the matter than give his own time; and as the work was done quickly, I did not get much for my wire panels and fowl-house fittings, over which I had spent considerable time and labour, including money. The glazed roof was allowed to remain where it was, and it served as a shelter for chrysanthemums, veronicas and other hardy plants.

420. I have said that the back of the fowl run intervened between my little piece of ground by the side of the house and the long strip that led to the back door of the house occupied by the relieving officer, and a gap of about 6 feet came between the end of the fowl run and the corner of the wall of the building that served as scullery in the house of the relieving officer; and when I was in the garden I often became unpleasantly conscious of being watched when at work by eyes that belonged to visitors to the functionary already mentioned; and as I thought it possible that some one or other of his callers might be induced, after close inspection of the approaches, to favour me with an unannounced visit during the small hours of the morning, I proceeded to board this up also in the same manner, nailing strips two inches wide over the junction of the timbers to stop any gazing between the interstices. I had noticed that there was never any undue haste on the part of the dispenser of relief or any of his family, to answer the summons of his frequent visitors; and as this gave all the more time and opportunity for inspection of my premises, I lost no time, as soon as the idea of doing so entered my head, of putting the design into execution. But though lost to sight there was not the slightest chance of his visitors becoming to memory dear; for we were frequently unseen hearers of questions and answers, known to us all familiarly as "The Tramp's Catechism," in which the catechiser put the questions with intense vehemence of voice and manner; while the replies of the catechists were in nine cases out of ten rendered with a voice so subdued and in a manner so abject that their answers were inaudible. So it was a one-sided business altogether.

Additional fencing.

421. Hitherto I had been working at my carpentering hobby at another part of the garden, as the reader will find presently; but the notion suddenly seized me that I was throwing away a good opportunity for making a good workshop out of the space that I have mentioned, and which we are now considering. The other trellis had been long closed up with boarding; and I now boarded up the door, and proceeded to put up framing so as to cover in the ground entirely with a glazed roof, and convert it into an enclosed building

The third phase.

Roof of workshop and plant shelter combined

which I could use as a workshop as well as a shelter for plants in the winter, so my first care was to take down the frames that formed the roof to which I have already alluded as the roof of the fowl house; and to put up two strong rafters, one at each end of the house, across which a substantial timber was laid, running from one end of the house to the other. This bar—I can scarcely call it a beam, served to sustain the lower ends of the four thick bars, and slighter rabbeted bars between, such as are bought ready made at any woodyard for greenhouse work. The upper ends were fixed to a wallplate nailed to the side of the house. Ventilators were put in the roof in the second and fourth of the five spaces formed by the end rafters and the four intervening thick bars, and three greenhouse rabbeted bars were set between each of the principal rafters. Fillets were nailed to the insides of the end rafters and the thick bars, to form rabbets to correspond with those in the slighter bars, and the roof was then glazed in the upper portion, the bottom panes being laid on the bar that ran from side to side of the workshop, so that the rainfall passed over this, and was discharged on to the frames that had already done duty as the roof of the fowl house, and which were sustained on the upper edge or end by a stout fillet nailed to the lower side of the transverse bar, the lower end of each resting on the front of a gutter or shoot which was attached to the boarded fence within, as I could not put it outside to overhang my neighbour's premises, to carry off the whole rainfall into a down pipe of wood which I made in the corner of the workshop, and which looked like a stout support to the gutter and roof. The transverse bar was further strengthened by struts, the lower ends of which rested on a stout rail, screwed to the uprights that carried the boarding outside and the gutter within, and which furnished convenient

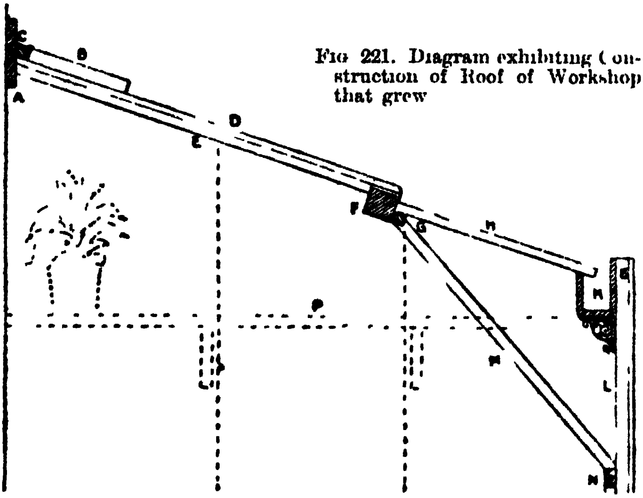


FIG 221. Diagram exhibiting Construction of Roof of Workshop that grew

means for stowing away boards and pieces of wood that awaited using up at one time or another in my wood-working.

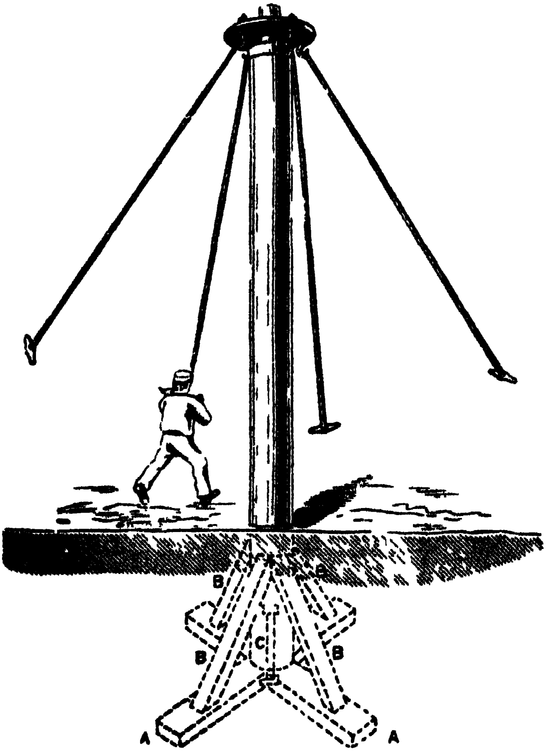
422. I have not thought it necessary to illustrate the above description of the workshop that grew with diagrams and sketches of every part, as many of these parts will be separately described and figured elsewhere; but I give in Fig. 221 a diagram exhibiting the construction of the roof of the workshop, that it may be more easily understood by those who may read it. In this A was the wallplate that was nailed to the front of the house; B, one of the ventilators attached by hinges to a slip C nailed to the wallplate; D, one of the principal rafters; and E, the fillet nailed to it to make a rabbet to take the glass; F, the transverse bar or beam, on and into which the rafters and bars are notched; and on which the lowest pane of glass rested and discharged the water that fell on it; G, the fillet nailed to F, on which the upper end of the glazed frame, H, rested; K, the gutter within and yet without the structure, resting on an ornamental bracket, and attached to one of the uprights, L, which carried the slips to which the outer boarding was nailed: N, a batten screwed on to L, and affording support to the lower end of the strut M, the upper end of which was notched and fitted to the fillet G, to lend support to the transverse beam F. The vertical dotted lines will help the reader to understand the arrangement of the trellis, O representing the door between the panels on each side of it; P shows the position of a broad and heavy shelf that was put up across each end of the workshop, to afford, as is shown, a resting place for half hardy plants in winter. This shelf was partly supported on broad brackets secured to the framing of the panels on each side of the door. The space above the shelf was boarded up at the end that faced the road, and glazed at the end that faced the garden.

Construction of roof of workshop.

423. Very little remains now to be said about the workshop that grew. The other end was, of course, boarded up, and within was a shelf similar to that at P, which was devoted to a like purpose. The boarding within was utilised in a variety of ways, being furnished with hooks and brackets here and there, to receive various small articles. Outside, the surface was worked so as to represent recessed Tudor arches, or rather panels framed in to form recessed Tudor arches. In the centre was a double door of the same pattern. I can hardly call the valves folding doors, for they were very narrow. Above the arches ran a fillet of semicircular form, terminating in carved ends with shields above the points of the arches. The deep recesses had vertical rails placed over them, attached to a transverse slip in the centre.

Completion of workshop.

To these rails creepers and everlasting peas were trained and tied in summer. A workshop more generally useful it is impossible to conceive. It was light and airy, though very warm in summer. In this I had my bench and sawing stool, and in this two of my three dear sons kept their bicycles there. We all spent many happy hours there, in one way or another; and when we quitted it for good and all, we left it with feelings of regret.



Giant Stride for Garden.

CHAPTER III.

THE CONSTRUCTION AND IMPROVEMENT OF DUSTBINS, PORTABLE AND PERMANENT: WITH HINTS ON THEIR ORNAMENTATION, ETC.

A Back Seat for the Dustbin—Insanitary Sanitation of Local Boards—Things usually found in Dustbins—What to do and how to do it—Usual Position and Construction of Dustbin—Stock Objections to Sifting Cinders—The Portable Dustbin—Importance of Strong Internal Framing—Hypothetical Dimensions—Framing of Front of Portable Dustbin—Framing of Back—Connection of Front and Back—Runners for Sieve—Materials for Floor: How to fix it—Outer Casing—Ledge Door in Front—Tar Coating for Interior—Covering and Door for Top—The Sieve: How made and how worked—Position of Permanent Dustbin—Cement Foundation—Coping of Wall—Framing for Front Elevation—Spacing and Setting out Framework—Completion of Front Framework—Covering of Lower Part of Framework—Coping of Sill above Boards—Arrangement for Back of glazed House—Roof of House—The Dustbin itself—Interior Fittings at End of Dustbin—Shelves in Auricula House—Ornamental Panel at Entrance—Beaded Standard.

A back seat for the dust-bin.

424. THERE is no corner of the suburban garden, be its corners few or many, more ugly or more repellent than that in which the dustbin is located; and builders in general, who have an eye rather to the *utile* than the *dulce*, have a most unhappy knack of putting it in a position in which it cannot fail to be seen from every back window of the house to which it belongs, or in which it is an eyesore to every one who happens to go into the garden. If a dustbin is absolutely necessary—and I do not think myself that it is so either in large towns or in small towns where things are properly managed—at least an attempt might be made to screen it, or make such additions to it as might serve to mask, and to a certain extent conceal, its original purpose, instead of thrusting it into painful prominence in all its hideous and obtrusive nakedness.

Insanitary sanitation of local boards.

425. I have said that dustbins would be unnecessary appendages to houses in any town in which the local sanitary board does its work properly. The usual plan is to keep a staff of dustmen, with carts of gigantic size, and horses incapable of going beyond a walk, who accomplish their beat, and perambulate the town or district that is under their charge about once in the course of a fortnight or three weeks, during which the filthy and festering mass which dustbins usually contain is allowed to accumulate, becoming almost past endurance in warm weather. I know that I shall be told

that a dustbin ought never to be offensive as far as any smell that may emanate therefrom is concerned, because nothing ought to be put into it but dust and ashes—that all green refuse from vegetables should be first dried on the top of the kitchener and then burnt within it—that grease should be consigned to the grease-pot—that bones should find their way into the unsavoury sack of the rag and bone man, and many other things of which I am fully aware, as well as of the difficulty of carrying out these little arrangements to the very letter, however good the will may be to do so.

Things usually found in dustbins.

Burning green matter and bones, which are often got rid of in this way, causes a most disgusting smell to permeate the house in which such an operation is performed; and where there is no place for the reception of garden refuse, to which vegetable refuse from the house may also be consigned, with tea leaves and coffee grounds, and all stuff of this kind, if it is not burnt, it must perforce go into the dustbin, where it all rots and tends to moisten the whole of the contents, which otherwise should be as dry when taken out of the dustbin as they were when they were put in.

426. I have described the way of going to work usually adopted by urban sanitary authorities, who, in nine cases out of ten, either do not know the right thing to do, or, if they know it, stubbornly refuse to do it. The right way of getting rid of house refuse is to let the dust carts go through every street in a town every morning, Sunday excepted, between 7 and 9 a.m., and to compel every householder to have the refuse of his house deposited in a suitable vessel at the edge of the pavement or side walk of the street, so that a couple of dustmen, one on one side of the street and one on the other, could empty vessel after vessel into the dust cart, as the horse slowly drew the vehicle from one end of the street to the other. When collected, it should be promptly taken away and burnt at once in a destructor. Under such an arrangement dustbins would be unnecessary, and as the dust could be taken away in far less time than under the present system (which encourages dilatoriness on the part of the men employed), and therefore at a cheaper rate, it ought to be to the benefit of the ratepayers, slightly as it affects the pocket, but considerably as regards cleanliness and health.

What to do, and how to do it.

427. The normal dustbin, in ninety-nine cases out of a hundred, is to be found in a corner where two walls meet at right angles to one another. Some old bricks are thrown together—the wall can hardly be said to be built—so as to form a side wall, and the front is formed of two brick piers embracing a slight framework of wood, grooved on opposite sides by nailing fillets to the face of the framework in front and

Usual position and construction of dustbin.

behind to receive a few short boards in a horizontal position, that may be taken out when the dust is removed, and replaced when the operation is over. A frame of wood in a slanting position, lower in front than at the rear of the structure, is laid on the side and front, and secured to the walls that form the corner; and on this some boards are nailed, one at the back and one on either side, leaving a central opening for the entrance of the ashes, etc., which is closed by a rough lid hinged to the board at the back, and supported by the front of the frame, and sometimes, but not always, by projecting slips attached to the under surface of the boards on either side. Such is the ordinary dustbin, a composite structure of wood and brick imperfectly held together, utterly guiltless of anything in the form of pavement at the bottom to resist the hollowing influence of the dustman's broad shovel; and sure to come to pieces after a few years' service, having no inherent strength to withstand the assaults of the servants and dustmen, who, generally speaking, are its only visitors. It is a badly contrived box, with a slanting cover to carry off or prevent the settlement of any rain that may fall on it, and nothing more.

Stock objections to sifting cinders.

428. Ever since I have been a householder, and that is more than half the years of my life, I have had,--from purely selfish motives no doubt,—a great objection to waste in any form; and this extends even to cinders, which no maid-servant who "knows herself" will condescend to sift if she can offer any excuse, reasonable or unreasonable, for not doing so. The most common pretext for avoiding the detested job is, that in its performance they get covered with dust, and are, in consequence, temporarily rendered unfit for other household duties of a more delicate and cleanly character. I am bound to admit that sifting cinders is not an operation of a desirable nature, and that the ordinary dustbin appears to have been contrived so as to lend colour to the stock excuse; for, in sifting cinders, whatever may be the kind of sifter used, whether with a handle, so as to keep the dust at arm's length, or without it, the cover must, of necessity, be kept open, and the dust permitted to fly in every direction, descending in a gentle shower on the maid herself, and on everything in its immediate neighbourhood. I have often been obliged to accept the excuse for the sake of peace; but my anxiety to save my cinders as far as possible, coupled with a desire to render my dustbin "a thing of beauty," and therefore "a joy for ever," instead of a perennial nuisance, set me thinking what might be done in order to arrive at the ends that I had in view. I have pictured the dustbin as it *is* made, and I will now proceed to show how it ought to be made, to my

mind at least, and how it may be rendered at least unobjectionable instead of an offence to every eye.

The portable dustbin.

429. Dustbins may be regarded as being of two kinds, portable and permanent. It is a difficult matter to decorate portable dustbins, but those that are permanent may be made both pretty to look at and utilised so as to serve purposes other than that for which they were primarily intended. The embellishment of the dustbin, however, is a secondary consideration, and must be left for future consideration. That which first demands our attention is its construction; and this I will deal with first of all, pointing out the methods of making dustbins of a plain and simple character, approaching the ordinary dustbin in form, but so constructed internally as to admit of the cinders being sifted within it by any one standing in front of it, the cover being kept tightly closed during the operation And as the *principle* of its construction is the pith and point of the whole matter, I will first consider the dustbin as a separate, independent, and movable structure, for the benefit of those who are not living in houses of their own, and who may wish to carry with them anything that they may make, instead of putting it up as a fixture or permanent structure to remain *in situ* for the benefit of the owner of the property and future tenants. Moreover, although I will presently give—as far as I can remember them, for I am writing from memory—the dimensions of a dustbin that I once made for myself, with its ornamentation, it is better to deal with the principle of construction first of all, and separately, leaving it to all who are inclined to make dustbins on the plan described, to suit the dimensions in every case to their own requirements, and the space and position at their command.

Importance of strong internal framing.

430. As the dustbin in its portable form will be very heavy, it is necessary to impart strength to the structure by first making an internal framing, to which the exterior casing must be nailed. It is no use to attempt to make it like an ordinary box by nailing front, back, and bottom to the sides; for a box thus made will not be strong enough to bear the wear and tear of daily usage. In Fig. 222 I have given a view of the front and back elevation, combining the two, in order to save a diagram. It looks complicated; but, it will, I think, be clear enough to the amateur carpenter when he studies it by aid of the text. Fig. 223 exhibits a view of the side elevation, and in Fig. 224 a plan of the interior when viewed from the top. My chief aim in constructing these diagrams has been to show the internal framework, but in each and all of them the external casing of inch boards is clearly indicated. The front and back each form a separate

piece of framing, which are afterwards connected by bars and ties at the sides and bottom, thus completing the interior framework, or skeleton of the dustbin, as we may call it. For the sake of obtaining some system of measurement, and also because the size is suitable for a dustbin, let us suppose we are about to build a dustbin 3 feet square at the bottom, 3 feet high in front, and 3 feet 6 inches high at the back. If the dustbin is to stand under cover, it may be 3 feet high at the back as well as in front, and have a flat top; but I have shown a sloping top, because it is fair to suppose that in most cases a portable dustbin will be exposed to the weather.

Hypothetical dimensions

431. Having provided ourselves with a few 12-feet lengths of quartering 2 inches square, we may first cut six pieces, each 3 feet long, represented in Fig. 222 by A, B, C, D, E, F, of which the uprights C, D, E, F, must be tenoned at each end to fit into mortises cut to receive them in A and B. The tenons may be ½ inch or ¾ inch wide, and go right through the horizontal pieces. The length of each tenon will be 2 inches, equal to the width of the quartering employed. In order to produce a very nice piece of work, the piece A may be 2½ inches deep and 2 inches thick, so that it may be planed down at the outer edge in a slanting direction, to allow of the cover being bedded entirely upon it, instead of resting only on the outer edge. Next, two pieces, G and H, each 20 inches long, with their tenons, one at each end, must be cut, and

Framing of front of portable dustbin

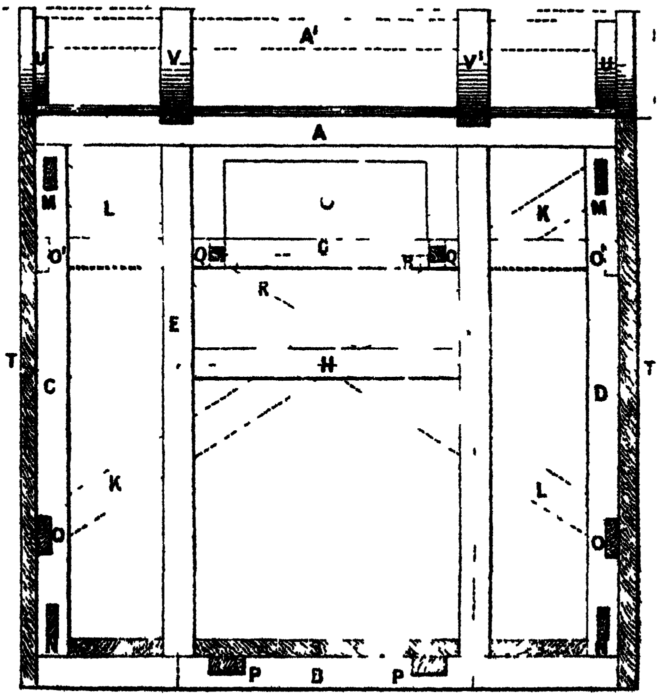


FIG. 222. Front and Back Elevation of Dustbin combined. Scale, 1 inch to 1 foot.

mortises made for their reception in E and F. Those eight pieces compose the framework of the front; they may be put together and put aside, but they must not be fastened, for there are other mortises to be cut in some of the pieces before this can be done.

432. The back is made in a different way; and for it, two pieces, A′ and B, will be wanted, each 3 feet long; and 2 pieces, C and D, 3 feet 6 inches long. If the top is to be flat, the pieces C and D need be only 3 feet long; but if sloping they must be of the extra length stated, and the width of A′ may be $2\frac{1}{2}$ inches, to admit of planing the upper surface to a slope from the back edge to the front edge. Another piece, G, which must be 3 feet long, must run from C to D, as shown by the dotted lines in extension of G, and as no uprights are put in the back similar to E and F, the framing may be strengthened by two diagonal ties, K K, L L. These should be 2 inches wide at the least, and cut out of stuff 1 inch thick. This will complete the framing for the back for the present.

Framing of back.

433. The framing in front and at back being thus made and ready for fixing together, it is necessary to consider the method to be adopted in connecting them, and this may be seen from Fig. 223. We want four pieces of quartering, M and N, each 3 feet long, and 2 pieces of stuff 1 inch thick, 3 feet 6 inches long, and at least 2 inches wide, as shown at O O′. The quartering must be cut in tenons at each end, and mortises for the reception of the tenons made in C and D, as shown at M and N, in each of them in Fig. 222; and notches must be cut in these pieces at O and O′, for the ends of the diagonal stay as shown. Further, two rails shown at Q in Fig. 223, 2 inches wide, 1 inch thick, and 3 feet long, must be cut and tenoned into G in front and back, as shown in Fig. 222 at Q and Q; and to the inside of these rails two slips, R, R, 1 inch square, must be screwed level with the bottom of Q, Q, to form runners for the sieve, which, when the dustbin is complete, will be moved backwards and forwards *upon* R, R, and between Q, Q. Lastly, two bearers, P, P, 3 feet long, 1 inch thick, and at least 2 inches wide, must be notched into B, B′, running from front to back. The skeleton is now complete, and may be fastened together, and this may be done by screwing down the stays and bearers, and by driving wooden pegs through the tenons. Thin wedges may also be driven into the ends of the tenons, where they appear through the uprights and horizontal pieces, in order to make the framing as rigid as possible.

Connection of front and back

Runners for sieve.

434. The floor of the dustbin is the next thing to be considered. It will be better to make this of elm or oak, say of elm, because it is cheaper

than oak. Get some small elm boards 1 inch thick, and cut off the rough edges, so as to produce planks 9 inches wide. Cut them 9 inches full, that is a very little over 9 inches. Put these boards in such a way that they run from side to side of the bottom of the bin; thus they will be forced into the place they are to occupy between the cross-piece N, and the bearers, P, P. Notches must be cut in the corners of the outside boards, to allow them to be fitted within the uprights C, D, and come flush with the outer surface of B, and notches must be cut for the intermediate uprights, E, F. The outer edge of the front board will then be as shown at S, S, S, in Fig. 222, and the ends of the boards shown at S, S', S'', S''', in Fig. 223 will be flush with the outer surface of N. When the boards S, S', and S''' have been fitted in, S'' can be driven in, forcing the entire set tightly and closely together. They may then be screwed down to the bearers, P, P, and the outer edges of the outer boards, S and S''', nailed to B in front and at back. The ends of the boards must be nailed to N, the nails being driven in an upward direction. To do this the dustbin must be turned upside down or on one side.

Materials for floor: how to fix it.

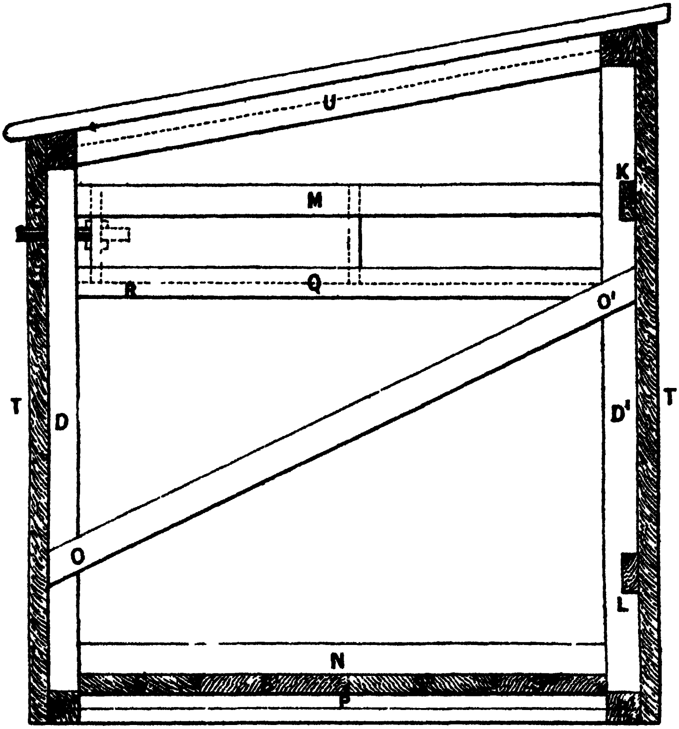


FIG. 223. Side Elevation of Dustbin. Scale, 1 inch to 1 foot.

435. The outer casing of boards may now be put on, and for this good sound deal should be used. White is good enough. It is denoted in each figure by the shaded parts lettered T. If the maker can manage it,

Outer casing.

the boards may be grooved and tongued together; if not, nail down the outer boards, first at the sides, and then at front and back securely, and force in these between them, to ensure a tight fit. The boards must be put on upright from top to bottom, and if they are not grooved and tongued, slips 2 inches wide and ½ inch thick may be nailed over the joints to make a finish, and to hide any gaping between the boards through shrinkage.

Ledge door in front.

436. In the front the external casing must extend only to the dotted line shown on E, F, and H in Fig. 222, leaving a piece on each upright and the cross-piece 1 inch wide. These spaces serve as stops at the top and sides for the door—a small ledge door made of inch stuff, which must be attached to the casing against E and secured with a button screwed on to the casing against F; the lower part of the door will close against B. The hinges used should be 2 inch butts of cast iron, and they may be laid flat, when open, against the door and the adjacent casing, and screwed to each accordingly. This saves a good deal of trouble in fitting in the usual way. By the arrangement of the floor, no obstacle is offered to the removal of the dust by the dustmen.

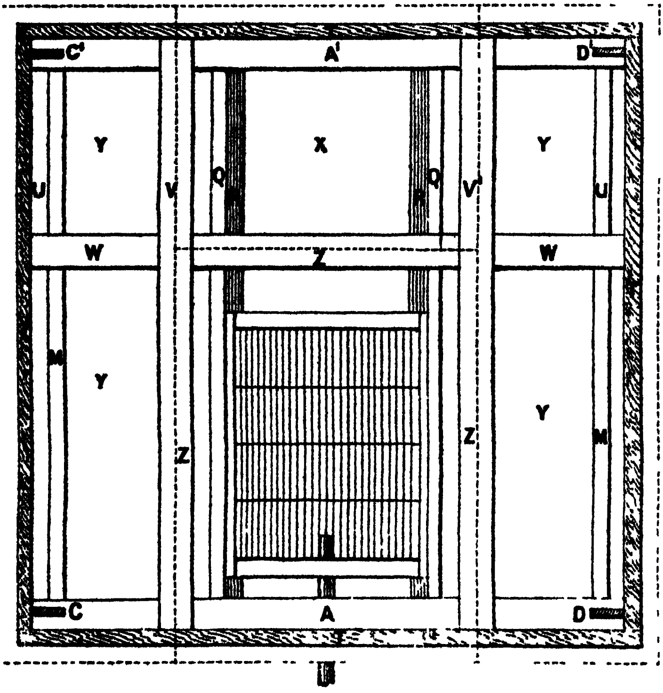


Fig. 224. Plan of Dustbin viewed from Top Scale, 1 inch to 1 foot

Tar coating for interior.

437. It will have been noticed that no side piece has been inserted from front to back at top, between A and A′. A shallow groove, say ¼ inch deep, can be cut in the inner surface of A and A′, and a piece, U, 2 inches wide and 1 inch thick, dropped in, having its upper surface

level with the ends of the boards that form the casing. Nail or screw the upper ends of these boards to this piece U. The dustbin is now complete, with the exception of the top, and before this is put on, the inside, front, back, sides, and bottom, should be well coated with tar.

Covering and door for top

438. In Fig. 224 the portions of the parts already named, which are visible in the plan, are similarly lettered, and there will be no occasion to recur to them. Having planed down A and A′ to the requisite slope, which will correspond to the inclination of U in Fig. 223, cut two pieces of stuff, 2 inches wide, 1 inch thick, and 3 feet 6 inches long, as shown at V, V′, in Fig. 224, and another piece, W, W, of the same width and thickness, and 3 feet in length; halve these pieces together in the form shown; halve the ends also to the requisite distances, and drop the piece of framing into notches cut for its reception in A, A′, and U, U; the notches should be ½ inch deep. This being done, prepare boards to cover the parts marked X, and Y Y, Y Y. Rabbet the boards together, and bring them to the dotted lines, Z, Z, Z. The parts of V, V′ and W W left uncovered will serve as stops for the lid or cover which is to be placed over the space left open, and attached by 2-inch iron butt hinges to the boarding that covers X. The extent of the boarding by which the dustbin is covered in is indicated in Fig. 224 by the exterior dotted lines.

The sieve how made and how worked.

439. Lastly, a sieve must be made to work backwards and forwards on the runners, R, R. This must be rectangular, and in external measurement, as shown in Fig. 224, is 16 inches long and 13 inches wide. It is simply a frame 6 inches deep, formed by nailing two sides ¾ inch thick to two ends 1 inch thick. The wire bottom is then made as shown, holes being bored in the sides for the three thicker wires running from side to side of the sieve, and in the ends ½ inch apart, or ¾ inch, as preferred, for the slighter wires running from end to end. When all the wires are inserted, the thinner wires, which should be above the thicker wires, must be bound to the latter with slight copper binding wire sold for this purpose. The method of working the sieve is apparent from the figures. A round hole is made in the front of the sieve corresponding exactly to another of slightly larger size in the casing over the door in the front, and between A and G. A stick--an old broom handle will do is passed through the hole in the casing, and through the hole in the front of the sieve, and held in place by two pegs or nails, passed through holes in the stick, as shown in Figs. 223 and 224. The ashes are thrown into the sieve, the cover shut down, and the sieve then pushed backwards and forwards by means of the stick, until

the cinders are thoroughly freed from dust. The cover is left closed until the dust has subsided, when it is opened, the handle removed, and the sieve taken out. The operation is a cleanly one, and cannot be objected to by the most fastidious of women-servants. When not in use the sieve is pushed to the back of the dustbin, and the stick put away inside across the bars Q, Q.

440. The permanent dustbin which I once built for my own use in the garden of a house which I occupied for a great many years was in a position which offered many advantages for the object in view. It was in a corner formed by the junction of one side of the garden wall with the scullery. There was an old dustbin there which was literally falling to pieces; so I made up my mind to remove it as soon as possible, and put up a new dustbin in its place. That the reader may thoroughly understand the position and the conditions of the spot on which I had to go to work, I have given here, on the scale of ¼ inch to 1 foot, a diagram of the corner. In this A B represents the scullery wall, a wall of only one brick in thickness and joist, and B C the garden wall. This was what may be called a panelled wall, and its construction is shown in Fig. 225. It is a 9-inch wall as shown, both at top and bottom; and at intervals the wall for about 18 inches is of the same thickness from top to bottom, as shown from B to the commencement of the dotted lines in the wall itself; and these solid pieces are usually strengthened by the addition of a small buttress, one brick thick, which projects in front and sometimes on the other side of the wall as well. Between the solid portions, and the base at the foot, and the coping above, the wall is only one brick thick; that is to say, 4½ inches instead of 9 inches; and it is done to save bricks, for, as a matter of course, only half the number of bricks are wanted for the panelled part that would be required for the solid wall. The length of the wall from A to B is 6 feet, and from B to C 3 feet, and on the quadrangular space A B C D, I determined to make my dustbin, and the superstructure that covered it in.

Position of permanent dustbin.

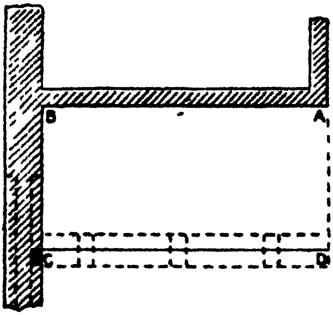


FIG. 225 Diagram showing Corner for Dustbin

441. Outside the solid line C D, it was partly border and partly path; and there was a very thin cement pathway by the side of A, B, that led up to the original dustbin. It was not safe to attempt to put up anything along C D, as things were; so my first care was to open out a trench 9 inches wide along C D, between the dotted lines on each of C, D, by way of a foundation

Cement foundation.

Coping of wall.

for the framework I intended to put up, just outside C D, which is just 3 feet from A B. As the border sloped down to the pathway, the soil at C was slightly above the top of the trench, or, I should rather say, the height to which I intended to fill it, and slightly above the pathway at D; but this did not matter, as I intended to break up the pathway as far as D, and make a broad border 6 feet in width from C to D. The foundation was of concrete; and I inserted in it, as I brought it up to the height I wished, three or four wood bricks or blocks, as shown by transverse dotted lines, for the purpose of securing the framing by nailing it down to the blocks of wood thus inserted. Between the bottom part of the garden wall and the heavy coping, and on the garden side of the line D, I inserted a piece of quartering, 2¼ inches by 2 inches; so that I had plenty of fixing for the framing I was about to make to stand on the garden side of the line C D. This quartering with the wood bricks in the concrete furnished me with good means of fixing the framing in front, which I now proceeded to put in hand. I may as well take the opportunity of saying it was 13½ inches in depth, and was made up in this way, namely, A, a course of headers laid across the top of the panelled part of the wall; B, three courses of headers and stretchers above the course of headers; and C, a course of bricks laid on edge or side to form a finish to the coping. In bricklaying, bricks in a 9-inch wall, so laid that one end shows itself on one side of the wall, and the other end on the opposite side, are called headers; and bricks laid so that the entire length of one side is visible are called stretchers. The headers are put across at intervals with the stretchers to bond or tie the wall together; and in order to "break bond," as the phrase goes, or to prevent junction between the ends of stretchers that immediately follow a header, a half-brick and sometimes a three-quarter brick is inserted next to the header. I cannot go deeper into the mysteries of bricklaying here. Those who want to know more must be referred to *Every Man his Own Mechanic*, in which they are duly set forth and explained. A course of headers similar to that shown at A usually forms the top course of the lower part of the wall on which the panelling is laid.

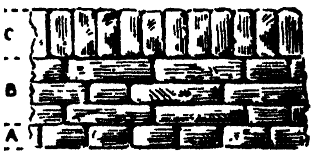


FIG. 226. Coping of Panelled Wall.

442. The first thing I had to make was a frame to serve as the front elevation of the small building or glazed structure under which the dustbin was located. The wall was about 5 feet high, and belonged to the house on that side of the garden, so I was justified in carrying my work to the edge

Framing for front elevation.

Spacing and setting out framework.

of the wall on the other side; and, as I have said, the wall was 9 inches wide at the top, and as the length of the end wall was 6 feet, and the width of the wall 9 inches, I had to make the top rail and the next rail of my framework 6 feet 8 inches long, which left 1 inch for the boarding of this thickness with which I intended to cover in the end. My framing was made of quartering 2¼ inches by 2 inches, and I put the broad part so as to make the longer measure the width, and the shorter measure the depth of the framing. The rails and uprights of the framing were halved together, as this was the quickest and easiest way of making the jointing. As I wanted six square panels in the upper part of the framing, I was obliged to set out my work on a rod. The panels, I should say, were in two sets of three, one above another, and the upper three were to be glazed, and the lower three of ornamental trellis work. I have already shown the reader how to calculate his spacing and set out his work on a rod, so I need not and will not do this again, and will content myself by saying that as I had to take away from a length of 81 inches width of wood nailed to side = 1" + width between first two standards = 5¾" + width of five standards = 2¼ × 5 = 11¼" the whole making together 18 inches; there were 63 inches left as aggregate spacing between second, third, fourth, and fifth standards,

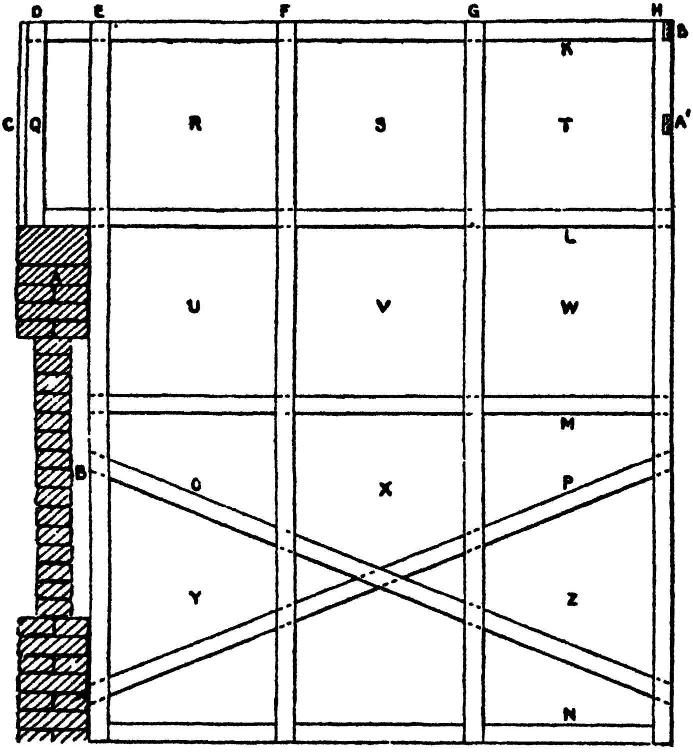


FIG. 227. Diagrammatic View of Front Framing

which gave 21 inches for each opening. I could then see exactly how my framing would be arranged, and I could further see that 21 inches square would be a very convenient size for the glazed windows and trellised panels, about which I will say nothing now, as they will be dealt with in future chapters when I pass on to the making of trellis work and lights. It is not so much with the adornment as the construction that I have now to do: the rest will follow in due season.

Completion of front framework

443. As there is much that is peculiar and instructive in this framing, I will give here a diagram of the front framing on a scale of ½ inch to 1 foot. It is not large enough perhaps to show any details, but I can give these when necessary on a larger scale. It will be remembered, that the top of a 9-inch panelled wall had to be taken within the glazed structure that I was preparing; so I resolved to let my second rail rest on the wall; in Fig. 227, A represents a section of the wall, and B the piece of quartering, that I have spoken of as having been jammed into the wall between the top of the base and the shoulder of the coping; C represents edge of timbers nailed to end framing to form end of house, and to D a short standard 25½ inches in length, which, with adjacent parts of rails formed the shoulder of the framing that rested on the top of the wall; E, F, G and H, are the four long standards or uprights 7 feet 6 inches long, into which the rails K, L, M, N, were notched, or rather, halved at the back, the halved joints being shown by dotted lines; O, and P are diagonal braces halved into lower parts of standards and into each other to strengthen the lower part of the framework; Q shows the open space between standards D and E, and rails K, L, which was ultimately covered in; R, S, T, are three square spaces 21 inches square, which were eventually filled with glazed lights; and U, V, W, three square spaces of the same size, which were filled in due season with panels in trellis work of a Japanesque type. The whole had a very pretty effect, and completely eclipsed anything to the contrary that might have been produced by the dustbin, pure and simple, had it been allowed to remain unscreened and conspicuous in its primitive naked glory.

444. With regard to the covering in of the lower portion, thereby hangs a tale, which my readers will think is generally the case with all the work that I have done and do. I cannot plead, with Canning's "Needy Knife Grinder," "Story, God bless you! I have none to tell, Sir!" And I can only hope, as I have not only a story, but many stories to tell, the sixpence confidingly asked for by the poor tinker will not be withheld with condemnatory language of the most forcible character, but that a heavy

rain of that little coin will set in upon the publishers, that they will be led to hand the author a *pour boire* of foaming Epernay in a golden cup. You may be sure that, humbly following an excellent historic example, if they say, "Give that cup to the author of *Every Man his Own Mechanic*," I shall ask, "And the champagne, too, gentlemen?" Measuring along the rail M, the reader will find it is exactly 6 feet from end to end, if he have forgotten that it is so. I found, that although it would have been easy enough to have boarded the open space between M and N with a dozen 6-inch boards or eight 9-inch boards, the narrowness of the spaces left between when the lines of junction were concealed by 2-inch slips, would not have served me so well as wider boards to carry out the purpose I had in view. Could I have got 12-inch boards it would have been right enough, but this is impossible. The widest thing that you can get in boards is only 11 inches, and six of these only cover between them a breadth of 66 inches, whereas I wanted to cover 72 inches. And though everything is said to be elastic to a greater or less degree, inch plank is not possessed of that elasticity that would enable me to stretch an 11-inch plank to 12 inches. I did not want to take the trouble of nailing a 1-inch slip to the edge of each board; and yet, what was to be done? At last, I cut the Gordian knot of difficulty by leaving gaps between them, making the gaps as small as possible, and nailing slips 2 inches in width over the gaps. By doing the same on the inner side, the joints, open as they were, and therefore joints by name only, were hidden from view. I had to measure and mark the place for each slip very carefully as I went along, from standard H to standard E; but it was no easy work to cut my coat, or rather coating, to meet the exigencies of the material at my command; but it was done successfully at last, and I immediately nailed on a headpiece, 3 or 4 inches wide,—I am inclined to think 4 inches along the board- level with the upper surface of the rail M. This board was ⅝ inch thick, of the same thickness as that which was used for the slips. I also put on a broad piece twice as thick and bevelled to a slope along the top to the bottom of the boards, resting, as did the rail H, on the concrete foundation I had prepared; and thus I had a series of nice panels about 10 inches in width or nearly so. "Why did I want panels of this width?" do you ask. Well, for the pleasure of putting a pretty heading of Japanesque trellis into each, which I will not describe now, but reserve for my chapter on trellises.

Covering of lower part of frame-work.

445. On the top of the board last put on, and over the heads or ends of the 11-inch boards, and just in contact with the outer edge of the rail M, I put

Coping or sill above boards.

a *quasi* coping of ½-inch board, 3 inches in width; and as this was very much bevelled off, and so reduced in thickness at the edge, I attached it to a piece of wood ¾ inch thick, and of sufficient width to bring it flush with the edge of the sill. This gave an idea of substantiality to the sill itself. The sill butted against the standards all along, and rose ½ inch above the upper surface of the rail M. My object in doing this was to form a rabbet along the top of M, against which my bands could butt. I finished the front by nailing slips 3 inches in width all over the faces of the standards E, F, G, H, and the rails H and L. The slips were ½ inch thick, and I halved them together in order to bring the faces of the slips to a level throughout. I gave a finish to the whole by nailing on slips ½ inch square in parallel lines along the 3-inch slips, just ½ inch within the edge as shown in Fig. 228, and filling the centre with a small pyramidal boss. The whole looked uncommonly well, as may be supposed, and a rabbet ½ inch wide was formed round all the open spaces at R, S, T, U, V, W. Even the ½-inch square slips were halved together before they were bradded down. It took a long time to do; and carpenters who have seen the work have often pondered how much time and labour it would run into if a chap got a job like that. It was reckoned that it would cost some halfpence. And it certainly would.

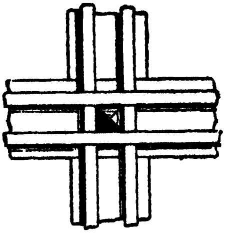


FIG. 228. Ornamentation of Front of House.

446. But I must hasten on. The scullery was a lean-to, and I had to adapt the back and roof of my little glazed auricula house; for I afterwards devoted it to the purpose of growing Alpine auriculas, a flower of which I am very fond, to the form of the scullery roof. Standards, exactly opposite to D, E, F, G and H, were fixed to the end wall of the scullery. Of these, that which was opposite H was of the same height—very nearly the height—of the front of the scullery; those opposite D, E, F, G, ran about 15 inches higher, and were notched at the back to receive a wall-plate 1 inch thick, that formed a lodgment for the rafters that formed the roof and afforded rabbeted bars for the glass. The standard H was connected with that which was opposite to it by rails notched into them, at A′ and B′, the space between the rails being filled with a piece of ornamental trellis to be described hereafter. The standard D was also connected with the standard opposite to it by rails at the upper and lower ends, and also by the rafter bars.

Arrangement for back of a glazed house.

447. A piece of quartering, 2¼ inches by 2 inches, was nailed as a wall-

plate along the rail D E F G H, and on this was placed a ledge bevelled off to nothing, so to speak, which carried a slanting piece of wood on which the edge of the glass rested, and which was set by the bevelled edge to correspond with the rabbets nailed to the bars, and to take the edge of the glass. The rafter bars were butted against the wallplate, and further sustained at the upper end by a bevelled slip nailed to the wallplate; and I must add that the bars were just notched on to this ledge. The bars were made of strips 1 inch thick, and furnished with rabbets of ⅜ inch wood. The roof was, of course, a small hipped roof; the hip running from the wallplate at the back to the corner above H. The rafter bars were placed at intervals of about 9 or 10 inches, I do not remember which, but this is of little importance. The glass was in single sheets, and laid in one plane in the rabbets from the top to the bottom of the roof. I have omitted to say that the rafter bars were notched on to the sloping ledge of wood or wallplate above the front rails. When all this was done, the roof was slightly above the roof of the scullery, but only sufficiently so to let the edges of the slates be lifted on to the rafter and cemented underneath. A moulded zinc gutter ran round the front and side to take the water from the roof, and this was connected with the gutter of the scullery by an inch pipe passing through the ends of each, so that the rainfall went into the scullery gutter, and into the down pipe therefrom, which took it into a large rain-water tank, whose contents were obtained when wanted by a pump in the scullery. The end boards had been previously nailed on between D and its opposite standard. The glass was bedded in putty, and bradded in, and the roof was painted and rendered watertight. I should have said that the roof space between D and E was boarded over and not glazed, in order to provide means, if necessary, for passing through it a ventilating pipe from the dustbin, a very necessary thing to be done in every permanent dustbin.

Roof of house.

448. We now come to the dustbin itself, which was constructed on precisely the same principle as that which was laid down in the description of the permanent dustbin. A front was made, 3 feet in height and 3 feet wide, and jammed in between the end of the scullery and the roof of the auricula house. A back of the same size was also made and put in place, and the front and back were connected by the necessary rails, as in the case of the portable dustbin. The arrangements for the sieve were precisely the same as were those for the door in front. In fact, my permanent dustbin was simply a replica of the dustbin portable, only it was so made that it could not be shifted, and wanted nothing on the garden side, as

The dustbin itself.

the bars to carry fixings for the sieve and top from side to side were screwed to the standards and diagonal pieces of the front. The top, fitted with a door for the reception of the dust, was flat; and for a considerable time, while I was finishing the fittings and decorations of the auricula house, I used it as a work bench, although it was destitute of bench screw, stop, and any of the fittings that belong to the bench proper. The floor in front of the dustbin was cemented. I nailed down a sill of hard wood over the lowermost rail of the front on which the bottom of the door worked, and the interior of the dustbin was paved throughout with hard bricks laid in cement, which brought the flooring up to the level of the sill. A sketch view of my auricula house is given in Fig. 230. It will be useful in assisting the reader to arrive at some idea of the ornamental appearance of the structure, which cannot well be comprehended from description and diagrams of a structural character only, unaided by pictorial representation.

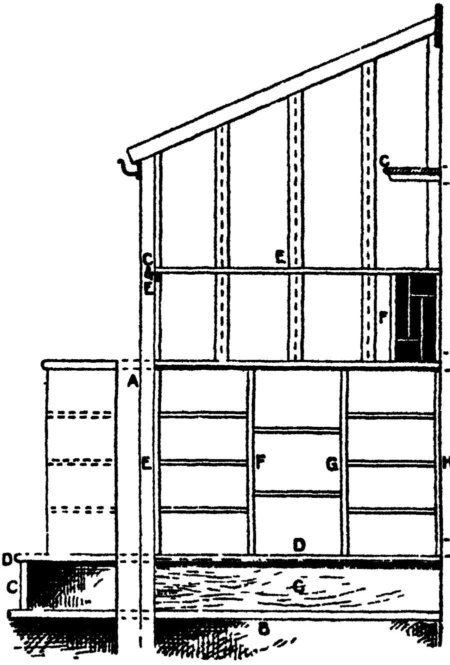


Fig. 229. End Elevation of Inner End of House, over Dustbin.

449. I have now to speak of the inner arrangements that were made over the dustbin at the end of the house, and to explain their construction and utility. They are shown in Fig. 229 on a scale of ½ inch to 1 foot, and correspond in size, etc., to Fig. 227, the connection between the figures being indicated by the dotted lines to the right of the diagram lettered K, L, M, which represent the rails K, L, M, in Fig. 227; L, A, representing the edge of the top of the garden wall. As I did not want the entire surface of the top of the dustbin as a work bench, my first care was to erect on B, the top of the dustbin, a stout riser C, on which I placed a strong 1-inch board D; the riser C was 6 inches in width or height, and was set up 12 inches from the back, outside measurement. I have given a side elevation of this part to the left of the figure, which may be helpful, lettered to cor-

Interior fittings at end of dustbin.

respond. On D I put up four standards, E, F, G, H, of ¾-inch stuff. The tops of these were level with the top of the wall; and I covered them in, wall and all, with 1-inch boarding. Thus I had three recesses, and I divided those at the sides into four pigeon-holes with boards ½ inch thick, and the central recess into three pigeon-holes. Thus I had eight pigeon-holes 11 inches long and about 6 inches deep, and three of the same length, and about 8 inches deep. The ledge at D was useful, I found, for putting any small tool on it when I was at work; and the recesses above for putting away small garden tools, such as trowels, forks, shears, hammer, garden nails, garden gloves, tarred cord, shreds, and other odds and ends constantly in request in a garden. The arrangement of the shelves enabled me to nail sides to ends of shelves without using any ledges for their support.

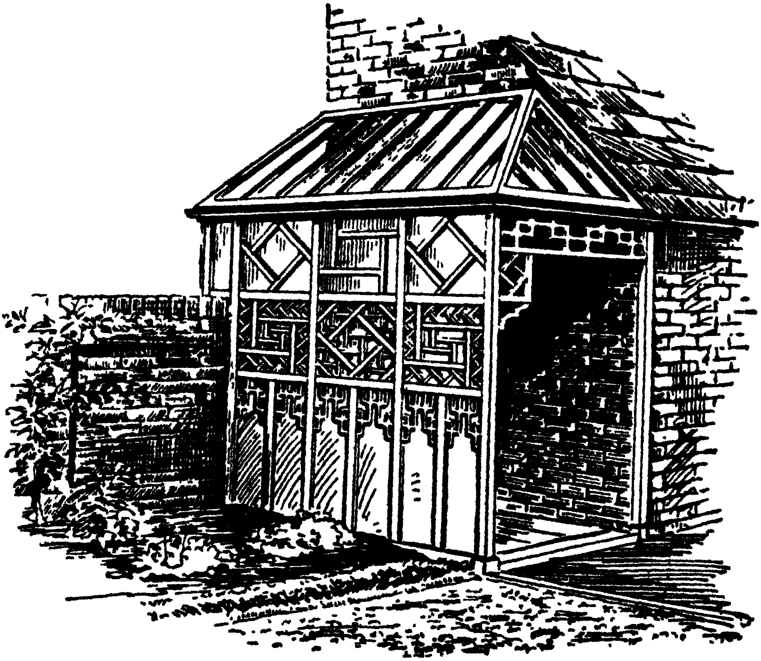


FIG. 230 Perspective View of Exterior of Auricula House over Dustbin.

Shelves in auricula house.

450. Referring for a moment to Fig. 227, a shelf ran along the rail L, supported by brackets screwed to the standards F, G, and H. I used bronzed iron brackets of an ornamental character. The inner end of this shelf was notched into that on the top of the wall and on the pigeon-holes. All the shelving yet undescribed, as well as the shelf along L, was made of floorboard 6 inches wide and about ⅝ inch thick, so I need say no

more with regard to this. There was only one shelf in the front of the house, so I was able to put in and take out the movable windows in the openings R, S, T, and the movable panels in the openings, U, V, W, at pleasure. A shelf, E, as shown in Fig. 229, ran across the end of the house. This was supported at one end by a fillet screwed to the inside of the uprights D and E, and at the other by a riser, F, which also gave support to a shelf on the same level returned to the rail shown at A′ in Fig. 227, and on brackets screwed to the standards opposite F and G, and fixed to the end wall of the scullery. This line of shelving was returned again along the rail A′, the inner edge, resting on a fillet 1 inch square, screwed to the lower part of the inside face of A′, so that the surface of the shelf and the top of the rail A′ were on a level. The outer edge of this shelf was held up by a slip of wood notched into the shelf at L, and then into the shelf at A′, which it held up, and then to the rafter which formed the hip of the roof, and to which it was carefully fitted. Above this was another shelf as shown at G, sustained by a fillet screwed to the boarding at the end of the house, and to the standard opposite D in Fig. 227; and this was further held up by brackets screwed to the standards opposite F and G, and by a tie notched into it near the outer end which was connected with the rafter above. The end was further carried by attachment to the rail B′ in Fig. 227. It may seem to the reader that I was over careful in supporting these shelves; but he must remember that they carried many flower pots filled with mould, and that the load thus placed on them was by no means a light one. For appearance sake, I fitted in a little trellis at the opening of the pocket at F, as shown in Fig. 229, and thus made a pretty little addition to the ornamentation of the structure. With this the work in the interior of the auricula house was brought to completion. The inside of the building I painted white; but for the outside I used a somewhat dark shade of terra-cotta colour, which I prefer to green, because it tends to show to better advantage the foliage and flowers of the creepers and other plants that may be grown against the wood work or near it.

451. If the reader will take the trouble to look at Fig. 230, in which the outside of the auricula house and the entrance is shown, he will see a long panel in trellis work just over the entrance, and a smaller panel just below it. The large panel served to prevent any plant from being pushed outward off the shelf along A′ in Fig. 227, and the smaller one served the same purpose, by enclosing the space between this shelf and the shelf below along the rail L. They were of an ornamental character, and altogether novel in appearance. They will be described, as far as construction goes, in the

following chapter on trellis work. Here, I think, I may bring my remarks on dustbins to an end. I recommend all those who make permanent dustbins to furnish them with a ventilating pipe, and, if possible, to allow nothing in the shape of animal and vegetable refuse, which, being organic matter, is perishable through decay and dissolution, to be thrown into it. Have the interior well coated with tar once a year, and now and then, especially after clearance, scatter chlorinated lime, popularly known as chloride of lime, over the inside. I find I have omitted to say, that the standards at the entrance were ornamented with vertical lines of beading ½ inch square, similar to that used on the front. The section of a 2-inch standard with ½-inch beading attached, would be as shown in Fig. 231. A ½-inch mopstick beading would look as well, where all the work used in decoration is of a rounded or semi circular character; but, in this any departure from the square form would have spoiled the general effect. The work occupied such short intervals of spare time that I had for very many weeks; but when everything was finished I grudged neither time nor labour I am sure that any one and every one who enters on work of this description and carries it out, will be as satisfied as I was when it is brought to a finish. Further, the time that is necessarily taken over the work naturally leads to many a happy after thought with regard to it, which would have been lost if the work, when once begun, had been carried on in haste and finished in a hurry. *Festina lente*, which, in an English dress, means "Hasten slowly"

Ornamental panels at entrance.

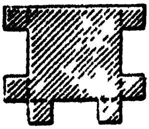


FIG 231 Standard with Square Beading at Edges

Beaded standard

Hanging Flower Pot made from Old Tin Can

CHAPTER IV.

TRELLIS WORK: THE MODE OF MAKING IT, AND SOME OF THE DIFFERENT FORMS IT MAY ASSUME.

The Value of Names—Objects and Purposes of Trellis Work Ordinary Forms of Trellis Work—Expanding Trellis—Fitting in Expanding Trellis on Framing—Ledge of Framing to form Rabbet Material for Trellis Work—Plasterer's Laths for Trellis Work Nailing Laths singly on Frame—Gauge for Distance between Laths—How to use Gauge—Conditions of Framing—Strengthening Ends of Standards to be put in the Ground—Sockets for Clothes Props—Testing Perpendicularity of Post and Socket—Stopper for Socket Top of Post—Distance between Standards and Rails in Trellis Work—Finish for Top of Trellis Work by Laths only—Finish by Capping—Finish by Capping and Crestboard—Alternative Modes of Fixing Crestboard—Preparation of Crestboards Rough Fences in Trellis Work—Rough Trellis Work in slighter Materials—Mopsticks for Trellis Work—Another Mode of Making Trellis with Mopsticks Mitre Box and Mould combined—Cutting Pieces of Mopstick—Halved Trellis Work in Bathrooms, Greenhouses, etc—Ornamental Trellis of various Kinds Trellised Panels in Auricula House—Frame for Panel—Filling of Central Opening—Treatment of Halved Joints—A Lesson in Notching for Trellis Work—Fitting Central Framing to Main Frame Filling up Oblong Side Openings—Formation of Alternative Panel—Ornamental Trellis Panel over Entrance to Auricula House—New Forms of Ornamental Trellis—Panels of Cruciform Character—How made—Trellis of Arrow Head Character "Trellis Royal"—Construction Graduation of Pattern and Materials—Bands—Fitting Parts of Trellis together

452. There are few prettier kinds of ornamental work for the garden, if indeed any, than trellis work, whether in the plain and ordinary form of laths placed one across the other, or the far less common forms which are generally classed together as Japanese or Japanesque trellis work; although I see no reason whatever for the name or in the name, except that it is convenient to call them so when speaking of them, because it saves a roundabout way of mentioning them when it is wished to call attention to them. There is sometimes very much in a name, and sometimes very little: very much, especially when it is used, as by advertisers, as a means of distinction between things of a sort or kind, and as a mode of drawing special attention to the article so called; but very little when the article so called would be as much prized under one name as under another: very much when it is fraught with meaning that may not appear immediately even to the most thoughtful and intelligent, but which has a special relation to the function or purpose of the person, place, or thing so named; but very little

The value of names.

when it is inaptly applied and inaptly chosen, and is in short what is usually styled a misnomer. Shakespeare makes Juliet ask and say—

> What's in a name? That which we call a rose
> By any other name would smell as sweet.

Truly it would, as far as smell goes; but the associations of colour, form, position among flowers, and others which I need not mention connected with the queen of flowers from time immemorial, would be utterly lost with change of name. A good old proverb runs, "Give a dog a bad name and hang him". There lived a man in days gone by who was accustomed to say that he did not care what people called him as long as they did not call him late for dinner. Here is two to one against the value of a name; but, after all, there is very much more, indeed, than people generally suppose, in a good name; that is to say, in a name that is well and fitly chosen and possesses significance, as all names should and most names do. I remember the introduction of a patent leather greave-like gaiter that was offered to the public under the strange-looking, strange-sounding name of *Antigropelos*: which, from its very strangeness, drew attention to the article to which it was given. There were few, however, that found out, or knew, that the name was a compound of three Greek words *anti*, against: *gru*, a particle: *pelos*, of mud or clay; and was therefore justly if eccentrically applicable to this protection against the mud and mire of any dirty roadway.

Objects and purposes of trellis work.

453. Trellis may be used in a variety of ways and for many different purposes, but chiefly as a means of division or separation, as in the case of a fence, for affording support for climbing or trailing plants; as a screen to hide or partly hide any unsightly or objectionable place or thing that one wishes to keep out of view as much as possible, and as a basis and reasonable excuse for ornamental work. We will consider its use under each of the different aspects, and look thoroughly into the different methods to be followed in making it. As a matter of course, my remarks on this part of my subject must not be regarded as being exhaustive: for I can only deal here with trellis work as adapted for garden purposes, and can in no way enter on the mysteries of its manufacture in elaborate turned work, known in this country as "oriental lattice work". For the information of those who may be curious as to the source from which the word has come to us, I may say it is almost identical in form with the French *treillis* from *treille*, an arbour for vines or climbers, which is to be traced to the Latin *trichila*, which has the same meaning; and it certainly has affinity to our English words "trail" and "train," which are to be traced to the Latin *trahere*, to draw.

454. In its primary significance, therefore, and in its primary form as well, trellis work is cross-barred work of any kind; that is to say, laths or bars, generally narrow in width, placed across each other in X form at any angle that may be determined, but mostly at angles varying from a right angle to that of 60° or 120°. That there may be no misapprehension of my meaning, I give in Fig. 232 examples of these forms; A, being square or rectangular trellis with the laths crossing each other at angles of 90°; and B, diamond or lozenge-shaped trellis, the bars crossing one another at angles of 60° and 120°. No remark is necessary on the square form; but on the diamond form shown in B, I may call the attention of the reader to the formation in this respect that the diamond or lozenge thus enclosed is two equilateral triangles placed base to base. The principle on which trellis is formed is that of the expanding and closing tongs, invented by the Marquis of Worcester, and described in his *Century of Inventions*. These were for the purpose of taking a red-hot coal or piece of burning wood out of the fire for the purpose of lighting his pipe. These tongs in their primitive simplicity are yet found in the pegged trellis or framing on which toy soldiers are placed for the amusement of children, and by which they may be brought into closely serried ranks, either longitudinally by closing the ends that are held in the hands, or horizontally by moving these ends as far apart as possible.

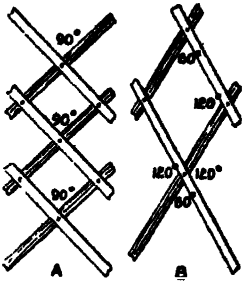


FIG. 232. Examples of Rectangular Trellis at 90°, and Diamond Trellis at 60°.

Ordinary forms of trellis work.

455. I suppose every home carpenter and amateur wood worker is acquainted with the expanding trellis sold by some ironmongers, wood yards, novelty shops and other places, and which may be bought and used by the amateur with good effect when he has any trellis work in hand that he wishes to put up with expedition. In this the nails that are put through the bars at every crossing or point of contact are turned, it is true, but they are not clenched, that is to say, the nails, generally wire nails, are not driven down so closely on the wood as to render simultaneous motion of the bars on the nails as pivots, impossible. These pieces of trellis, if large enough in themselves, may be expanded or contracted for covering in any area. All that is wanted in order to receive the trellis is a framework consisting of two or more standards or uprights, and two transverse horizontal rails, or more if it be deemed necessary. A ledge should be nailed either around the outer edge of the area thus formed, and on the vertical face of the

Expanding trellis.

Filling in expanding trellis on framing.

Ledge of framing to form rabbet.

framing forming a rabbet all round the face of the framing against which the trellis may be placed and into which it may be dropped. The ends of the bars must be cut so as to butt tightly against the ledge, and then be nailed or bradded to the face of the framing. Or the ledge may be nailed to the outer edge of the framing, or rather the outer faces of standards and rails. Practically the effect is the same in either case; but under the latter condition, the ends of the bars rest against the entire face of the framing, whereas under the former when the ledges forming the rabbet are nailed to the face instead of the outer surfaces of the framing, there is less on which they may rest, and to which they may be nailed. After the ends of the bars have been nailed down, the bars are practically immovable; but when this has been done the nails through the crossing should be firmly clenched. This is best done with the aid of an assistant, who should hold the back of the head of a hatchet against the back of each crossing in succession, where the end of the nail passing through it has passed outward and been turned, while the home carpenter strikes the head of the nail, two or three sharp blows with a hammer. The ledge or bead on face of framing or round the outer edge, for the figure suits either case equally well, is shown in Fig. 233, and with this before him the most inexperienced beginner at this kind of work cannot possibly mistake my meaning.

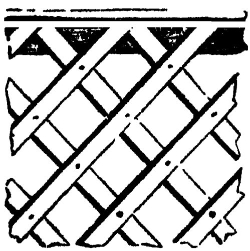


FIG 233. Ledge or Bead on Framing forming Rabbet for Trellis

Material for trellis work.

Plasterer's laths for trellis work.

456. The material of which the cross bars of trellis work is made usually consists of laths from 1 inch to 1½ or even 2 inches in width, and from ⅛ to ½ inch in thickness, according to the strength required in the trellis work when completed. Of course, the bigger the laths the stronger must be the framework to carry them. For fine work in a conspicuous position, the laths used should be planed up on faces and edges. They may be sawn from a board a little thicker than the required width of the bars, if the wood worker likes to take the trouble; but I do not think he will. He had better buy them all ready sawn, or sawn and planed for immediate use at the wood yard, where the work of sawing and planing is done by machinery suitable for the purpose. Wire nails a little longer than twice the thickness of the bars should be used for fastening the bars together at the crossings and clenching on the other side. For rough work, bundles of laths used in lathing and plastering the interior

of new buildings may be used. These are supplied in various lengths, from 2 feet to 4 feet or even more, if I remember rightly. They are classified as "single fir" about $\frac{3}{16}$ inch thick, and "double fir" about $\frac{3}{8}$ inch thick. A bundle of laths, whatever may be the length of the lath, is supposed to contain 500 feet run. The buyer must bear in mind that these bundles are very deceptive in appearance; those on the outside look very nice and even in appearance, and when the ends of the bundles are inspected they look all fair and square; but in this as in other cases, as man too often finds, "beauty is only skin deep"; for when the tarred cords by which the bundle is tied up are cut and the laths within are exposed to view, it will be found that those in the centre are miserable things, generally unfit for use, and that the outer laths have been artistically packed round those in such a way as will lead the purchaser to suppose that he is going to have the same kind of lath all the way through, which most assuredly he will not. Nevertheless, as I have said before, most of them will serve the purpose sufficiently well for rough work, especially with a little trimming of faces and edges with the plane. As these laths are very apt to split when nails, and especially iron or tinned tacks, are driven into them, a passage should be bored for them with a very fine bradawl, the edge of which should be inserted *across* the grain, and not with it.

Nailing laths singly on frame.

457. Supposing that the home carpenter has put up his framing and fixed it in the place it is intended to occupy, and then proceeds to nail the laths singly to the frame, he must first bear in mind that all the inner bars should be nailed on first, and then all the outer bars afterwards. I know he will be anxious to see the effect of the crossed work: but he must be content to put a bridle on his ardour, and curb his heart's desire until the first set have been nailed on from corner to corner of the frame. In doing this, it should be his aim and object to nail on the bars at regular distances throughout; so after having put on an initial bar, which had better be one of the longest, and whose position and proper angle of inclination should first be determined on, and then marked on the face of upper and lower rails of the frame with a bevel properly set to the angle, he should prepare a piece of wood, of the form shown in Fig. 234, as a gauge, to show the proper distance between each lath and the angle of inclination. Supposing that the central lath has been duly fixed, the angles at A or B in the gauge showing the angle of inclination at *top rail*

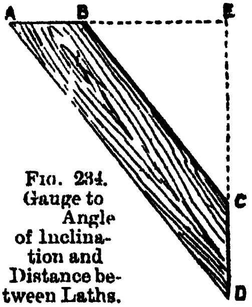


FIG. 234. Gauge to Angle of Inclination and Distance between Laths.

and *bottom rail*, and the angles at C and D showing the angle of inclination of the laths at the *sides* of the framing, the width of the gauge A B C D, representing the distance between the laths, all that has to be done to obtain regularity is to apply the edge A D to the edge of the lath already fixed on the *right-hand side*, and fit the angle A into the angle made by the lath with the framing, the end A B of the gauge butting against the ledge. Then mark with a pencil along the edge B C, on the face of the top rail, and then reversing the gauge and placing the edge B C against the edge of the lath and the end B A against the ledge on the bottom rail, mark along the edge A D with the pencil on the face of the bottom rail. Then apply the *left-hand* edge of the next lath to be put on to the pencil marks on top and bottom rails, and you will find that your two laths are equidistant and parallel throughout. And equidistance and parallelism between the laths will be preserved throughout, provided always that your laths have been set and cut to a fixed gauge, and that the edges of the laths are truly equidistant and parallel throughout their length, and that all the laths used are of one and the same width. When the laths approach the standards at each end of the framing, the angle at D will be the angle of inclination of the laths at the lower ends, and C D will butt against the ledge until the uppermost corner is reached, which is, or ought to be, a right angle, as shown by the dotted lines at E. The foregoing is the principle on which all trellis work of this kind should be made. The inner laths on one side of the initial lath have been put on in the same manner by the help of the gauge, those of the outer series should be put on in precisely the same way; and when all are fixed at the ends to the top and bottom rails and the standards at the sides, the nailing and clenching at the crossings should be carried out in the manner already described. Trellis work made on this principle cannot fail to be regular, and therefore satisfactory and altogether pleasing to the eye.

Gauge for distance between laths.

How to use gauge.

458. There are various conditions under which trellis work is made, and various modes of finishing it. I have spoken hitherto of trellis laths affixed to a framing that has ledges all round it, either nailed on the face of the framing or round the outer edge. In all cases, the face of the framing or sides to which the laths are affixed must be flush throughout. If it be intended as a fence or screen, it will be as well to strengthen it by having one or more transverse rails between the top and bottom rail. We will suppose that we are putting up a piece of trellis work for a screen, and that it is 6 feet square. There will be two standards of quartering 2 inches by 2¼ inches required; and if the standards are to enter the

Conditions of framing.

Strengthening ends of standards to be put in the ground.

ground they should be at least 8 feet long, so as to admit of the insertion of 2 feet in the ground; and to ensure stability and to enable them to last in the soil for some little time, it will be well to strengthen them by making them thicker and more substantial. This may be done by nailing rough pieces of wood to the four sides of the foot of each standard. Thus, supposing A in Fig. 235 to represent the foot of an upright in section, after giving it a plentiful dressing with coal tar, or slightly charring it in a fire prepared for the purpose, and supposing it to be 2 inches square, cut out four 2-foot lengths of rough wood elm is the best, because it lasts for a long time even when fully and directly exposed to the action of water -and having tarred or charred these also on the inner face and one edge, nail them to the four faces of the foot of the standard. These pieces should be 1 inch thick and 3 inches in width, and disposed round the standard in the manner shown by the attachment of the pieces B, C, D, E, in Fig. 235. In the arrangement shown, the side of each piece butts against the end of the piece adjacent and is nailed to the end or edge. Then in Fig. 235 each piece is nailed to A, but C is nailed to the edge of B, B to the edge of E, E to the edge of D, and D to the edge of C This affords a good strong jointing, and after the exterior of the casing thus made has been tarred or charred, the standards with its additions may be put in the ground.

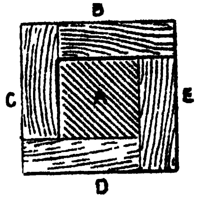


Fig. 235. Mode of Strengthening Standards set in the Ground.

Sockets for clothes props

459. And here by way of parenthesis, and that I may perchance forget to allude to it elsewhere, and still more so because that which I am going to mention is an essential unit in "Carpentry for the Garden," and I am reminded of it by what has been said and figured above, I will leave the subject of trellis work for a brief interval, to tell the home carpenter that if he be requested to make clothes posts for drying purposes in the garden, the sockets for the ends of the posts to enter and stand upright in are made in precisely the same way as the casing for standard described above. Fig. 235 was drawn on a scale of $\frac{3}{16}$ inch to 1 inch, but Fig. 236, although it may appear to be on the same scale as Fig. 235, must be regarded as drawn on a scale of $\frac{1}{8}$ inch to 1 inch. The clothes post shown therein

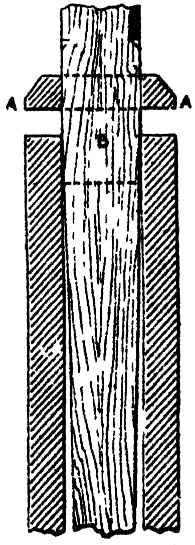


Fig. 236. Foot of Clothes Post and Socket.

Testing perpendicularity of post and socket.

is therefore 3 inches square at the top of the foot, and upwards to the top, where it may taper off very slightly indeed; and the boards of which the socket is composed are 1½ inches thick by 4½ inches wide. Indeed, it is better to cut them from ⅛ to ¼ inch wider than this, so that the clothes post may enter readily and have plenty of play. When the socket is put in the ground, it is necessary to put in the clothes post, that it may be tested with the plumb level, and adjusted to secure uprightness both in post and socket. When this has been proved to the satisfaction of the home carpenter, the hole that has been dug for the reception of the socket may be filled up with stones, brickbats, and earth, care being taken to apply the plumb level frequently during the operation to the clothes post, which should be left in the socket until the filling up and ramming tight with a rammer has been completed. The clothes post should be tapered slightly at the bottom, to ensure easy entrance.

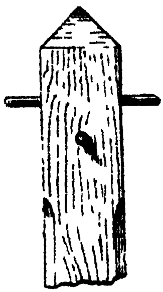


FIG. 237. Top of Clothes Post

Stopper for socket.

Top of post.

460 When you have made a beginning, it is as well nay, better to make an ending also as soon as you can, on the principle of the boy who, when his mother declined to put the cold plum pudding on the supper table on the plea that it could be eaten on the morrow, retorted by reminding her that she had often said to him, "Never put off till to-morrow what you can do to-day;" so for the same reason I will finish with the clothes post at once. Referring to Fig. 236, it will be noticed that a ledge has to be nailed round the bottom of the post, as shown in section at A, A′, which rests on the edge of the socket when the post is put up, and is brought into use, and prevents the post from entering the socket beyond a certain depth. When the post is removed and put by, a stopper is put into the socket, consisting of a block, B, to fit the socket itself, its size being defined by the dotted lines above and below the letter B, to which a cap is nailed, whose shape and size is defined in the diagram by the portions in section of the ledges A, A, and the portion of the post intercepted between them and the dotted lines that run across from one to the other. The top of the clothes post is made as shown in Fig. 237. It is brought to a pyramidal point at the end, and between this and the finish of the chamfering, two pegs are inserted as shown, between and over which the clothes line is passed to fasten it and hold it securely fixed.

461. So much for the clothes post: we will now return to a consideration

of trellis work as a fence or screen. We were dealing with a piece of trellis 6 feet square, with standards on each side and rails at top and bottom; and I will resume the subject by saying that in continuous trellis work 6 feet should be the utmost distance between standard and standard, and 3 feet between rail and rail. Thus, in a piece of trellis work 6 feet square, there should be 3 rails, one at the top, one at the bottom, and one in the middle. The rails should be notched into the standards, the ends of the rails being halved, or nearly so, and dropped into corresponding notches in the standards, so as to weaken both standard and rail as little as possible by reduction of thickness. Thus if the rail be 1 inch thick, notch it to the depth of $\frac{3}{8}$ inch at the utmost. This will leave $\frac{5}{8}$ inch as the thickness of the end of the rail that has to be dropped into the standard, and a corresponding notch $\frac{3}{8}$ inch in depth should be made in the standard to receive end of rail. This is better than cutting a notch 1 inch deep in the standard, which would unduly weaken it, and better than halving the end of the rail, which, although it would reduce the notch in the standard to $\frac{1}{2}$ inch in depth, would weaken the rail more than is desirable. Of course, the rails may be mortised and tenoned into the centre of the standards, but in this case ledges 1 inch square should be added to the standards between the rails to receive the ends of the laths. In this case vertical ledges against which the ends of the laths would butt on each side would be formed by the standards themselves, and the ledges at top and bottom may either be omitted or supplied by nailing ledges $\frac{1}{2}$ inch square to the upper edge of the face of the upper rail, and the lower edge of the face of the lower rail, or by nailing pieces after the manner of capping, say 2 inch by 1 inch battens the same as the rails, or even $\frac{1}{2}$ inch in thickness, to the upper edge of the upper rail, and the lower edge of the lower rail. Many ways of effecting the end in view will suggest themselves to the home carpenter; but it is manifestly impossible, when space is considered, for me to suggest and describe everything that may be done.

Distance between standards and rails in trellis work.

462. Naturally enough, the home carpenter will in some cases desire an ornamental finish for the top of the trellis work. There are many ways of doing this, and I will suggest or rather describe a few of the most ordinary methods. In the first place, if there be no ledge fixed to or on the top rail, and there is in consequence no hindrance to doing so, the laths may be carried above the top rail, as shown in Fig. 238, care being taken so to dispose the laths that a crossing may be effected in the central line, running longitudinally through the top rail, so that the

Finish for top of trellis work by laths only.

laths may be firmly fastened to it and to each other. There is a solidity found at the crossing of the laths which is not found where the laths run singly, that is to say, between the crossings; and if it is attempted to drive a nail through a lath with a space unfilled between it and the rail itself, the chances are that the wood worker will damage if he does not break the lath. Another thing in which great care must be taken is nailing and clenching the laths together, at the topmost point. In doing this, it is safer to let the ends of the laths project some little distance beyond the crossing, and cut the horns off with a small dovetail tenon saw when the nailing together has been safely effected.

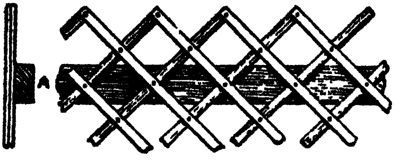


FIG. 238. Finish to Trellis: Laths carried above Top Rail A Section

Finish by capping.

463. Another mode of finishing the trellis work at the top is by surmounting the top rail by a capping, as shown in Fig. 239. This effectually protects both rail and laths from the influence of the weather, and the capping acts as a kind of small penthouse to carry the drip therefrom clear of the face of the trellis. The form of the capping is shown in the section at A. It is bevelled on each side, and the sharp arrises below are just removed with a small plane to give roundness to this part of the capping; and when I say "roundness," the home carpenter must understand that it is roundness to the edges only that I mean, and not the bringing of the whole of the lower part on each side to the form of an arc for part of the circumference of a circle. The height of the capping need not be more than half its width; but in all cases the greater the thickness of the capping, the greater should be the slope of bevel given to it on each side at top.

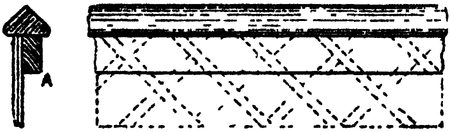


FIG. 239 Finish to Trellis: Top Rail surmounted by Plain Capping A Section

Finish by capping and crestboard.

464. There is yet a third method which is prettier than either of the above, and which I have often used with the best possible effect, and that is finishing by a crestboard or cresting. This is shown in Fig. 240. Now there are various points in connection with this mode of ornamentation on which it is needful to speak. Firstly, as to how it may be fixed. This may be done in two ways. One is to plant it on or rather in the capping, and the other is to use no capping at all, but to screw the lower edge of the crestboard to the top rail, which may be made half as wide again

for the purpose of receiving it and affording a means of attachment of sufficient width. In this case, the lower edge of the crestboard will form with the face of the rail the rabbet into which the ends of the laths are dropped. It looks well enough on the side to which it is screwed to the rail, but not so well on the other; and if the other side is so situated as to be frequently seen by the owner of the trellis, it may be desirable to nail at the back of the crestboard and on the top of the rail a piece of semi-capping as shown in section at A in Fig. 241. With regard to planting or setting it in the capping, this is shown in section at A in Fig. 240. A groove of sufficient width is ploughed in the capping, and in this groove the lower edge of the crestboard is inserted and fixed. A prettier form of capping is shown in section at B in Fig. 241. If the home carpenter is not sufficiently skilled to plough a groove along the top of the capping, he can make the crestboard deeper, and nail a bevelled slip to it, as shown at A on each side, but at the bottom of the crestboard instead of a little way up. This will bring the bottom of the crestboard and the two half pieces of capping on a level, and the whole must then be placed on the top of the rail and skew-nailed down to it.

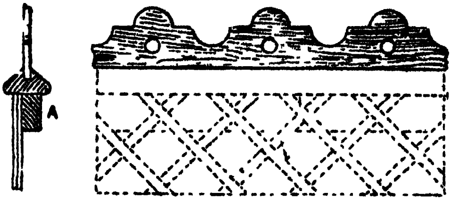


FIG. 240. Finish to Trellis: Top Rail surmounted by Capping and Crestboard. A. Section.

Alternative modes of fixing crestboard.

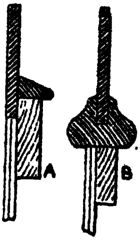


FIG. 241. Alternative Modes of Fixing Crestboard.

Preparation of crest-boards.

465. The crestboard itself may be ⅜ inch in thickness, but it is safer to cut it out of a clean piece of board free from knots and ½ inch thick, or out of ⅝ inch board, well planed up to give it a good surface. This will bring it down to ½ inch in thickness. The chief object in having it of this thickness is to prevent as much as possible any chance of breaking off a projecting part, either in sawing it out or after it is cut out and fixed. The pattern should first be accurately spaced out and drawn on the wood, and then cut out with a keyhole saw. Any inequalities that are left may be subsequently reduced by using a rasp. Cutting out a crestboard is by no means an easy matter, especially to an inexperienced hand. With regard to pattern, a simple form easy to cut and effective in appearance is shown in Fig. 242. The salient and re-entering parts are shown in this as circular in form, but they may be made pointed after the Gothic style of arch, if preferred: this is a matter of inclination only, and of the two forms

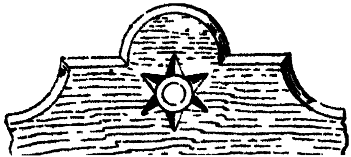


FIG. 242 Enlarged View of Part of Crestboard, showing Detail

perhaps the pointed form is easier to cut than the circular. In Fig. 242 I give an enlarged view of a portion of the crestboard, showing clearly and plainly to the eye every point of detail throughout which could not well be exhibited in the smaller diagram. If the edge of the cresting be lightly chamfered or bevelled in front, as shown in Fig. 242, it will be found to impart lightness of appearance by apparently diminishing the thickness of the board; whereas this mode of treatment only fines down the edge, but in no way lessens the substantiality of the wood except at the very edge, which makes no difference whatever to its enduring power. Holes may be bored through the wood in the position shown, and a star-like appearance given to it by incised points made with a sharp chisel. But holes taken right through the wood are a source of weakness, and render the chances of fracture along the line in which the hole lies all the greater. It will be better to make a recess to the depth of ⅛ inch with a centre bit, or even a large rose bit, and then to cut the points. By this means a little ornament is safely carried out, and the board is in no way weakened to the extent it would be if the hole were made right through. The form of ornamentation shown is about the safest that can be adopted. All forms in which the salient part is wider than the part that connects it with the lower part of the cresting should be avoided. Thus the form shown in Fig. 243 is an unsafe one. It is a pretty form to look at, and easy to cut in one way; but the narrow neck at A B is a source of weakness, and it is liable to fracture both during cutting and after fixing, if the cutting be successfully managed.

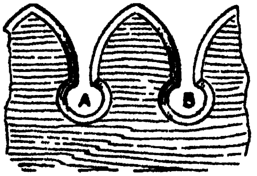


FIG. 243 Unsafe Form of Cresting

Rough fences in trellis work.

466. Let us now deal with trellis work as a rough mode of fencing, adapted for the separation of one part of a garden from another, or even as a means of enclosure. The form and general appearance of such a fence is shown in Fig. 244, which may be taken as a fair representation of all kinds of fencing of this character. Such a fence, whatever may be the material of which it is made, has the merit of being strong and lasting. It requires no standards or rails, and is therefore complete in the form shown without any adjuncts. The number of diamond-shaped openings in it would depend on its height and width of the material of which it is

made, or its diameter if round or semicircular. Thus, a fence of, say, from 4 to 6 feet in height, if made of the tops of larch, spruce, or fir, from 2 to 3 inches in diameter, and sawn in two longitudinally, would in all probability show the number of openings and the general appearance exhibited in the illustration; but, if it were a dwarf fence from 3 to 4 feet in height, the earth line would be about the position of the line A B; and further, when the material is wide, the angle of inclination of the stakes with the ground should not be so great; and the stakes should be more upright. This would have the effect of diminishing the width of the openings, and so rendering the fence all the safer and better calculated to prevent the passage of animals. Its defensive properties against inroads and excursions of this kind would be increased by running stout wire across the diamonds in the position shown by the lines C D, E F, and fastening the wire to the inner or flat part of the stakes by staples. The stakes should be sharpened at the lower extremity, and driven into the ground with the flat side turned inwards and the rounded sides outwards, and when fairly in position they should be nailed together at the crossings with long stout nails. It is desirable to put the wires between the stakes before the stakes are nailed together. It is an easy matter to get the wires into place before nailing, but one of great difficulty after this is done. The mode of procedure is precisely the same, whether the fence be made of poles sawn in half or of rectangular pieces of rough wood about 3 inches or more in width and half the thickness. Rough poles of irregular form, that is to say, not perfectly straight, such as large hop poles may be; but the effect is by no means so pleasing, on account of the want of perfect regularity in form and inclination, and of the diamond-shaped openings as well.

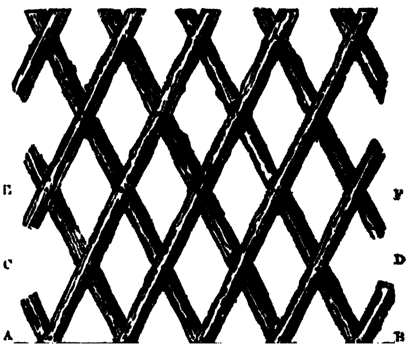


FIG. 244. Fence of Rough Stakes, disposed in Rustic Trellis Work.

Rough trellis work in slighter materials.

467. When fences of this kind are put up merely as lines of demarcation, and for separation only, and not for purposes of protection, they may be made of such light material as kidney bean sticks, which are from ¾ inch to 1¼ inches in diameter, or thereabouts. The remarks made above, with regard to the insertion of the stakes in the ground, and the mode of increasing or diminishing the openings by the altera-

tion of the inclination of the stakes to the ground, still hold good for the smaller stakes as for the larger; but as these are not sawn in half, and consequently cannot be placed flat side to flat side, they should be slightly notched into one another at the points in which they cross, so that they may have a better bearing one against another and a firmer holding than round sticks could possibly have if nailed together without notching. Such fences are well calculated for sustaining sweet peas and other plants requiring support either entirely or partially so; additional support, if required, being given by pea sticks disposed on the other side of the plants, that is to say, on the outside or by tarred cord run along the trellis work, and looped into it at intervals. The nailing together is best effected by wire nails.

Mopsticks for trellis work.

468. I have spoken of the materials of which trellis work is and may be made; but there is yet another, about which I have said nothing as regards its application to trellis work, although I have mentioned it more than once, and shall speak of it many times more in the pages of this volume yet to come. I am referring to the shaped sticks known as mopsticks or broom handles. These when sawn nicely and neatly down the middle lengthwise, make excellent trellis work when simply crossed, being placed flat side to flat side, and the trellis thus made is both strong and lasting. Although it is good for any length, I recommend the home carpenter to put it up in compartments of about 6 feet in length, using standards to enter the ground at intervals of this distance, and dropping or sliding the ends of the trellis work thus made into grooves made on each side of the standard by nailing slips to the edges. In Fig. 245, which affords a view of this kind of arrangement when seen from above, or in "plan," A is the top of standard, and B C, and D E, the upper ends of slips nailed to opposite sides of standard to form grooves into which to drop the ends of mopstick panels. The ends of the mopsticks are clear enough in themselves without any lettering; and an attempt has been made to show how one piece slopes in one direction and the piece attached to it at the top in another, which I trust the reader will understand without the aid of more diagrams. Over all is nailed a capping of the width of the standard, the dotted lines F G, H K, representing the outer edges of the capping. A piece of ornamental cresting may be run along the centre of the capping in a groove made for the purpose. The ends of the slips that form the grooves and of the mopsticks should rest on a foot

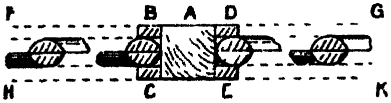


Fig. 245 View looking down on Mopstick Trellis in Grooves on Standards.

piece of the same width as the capping just grooved into the sides of the standards, and ledges of the same width as the slips that form the grooves may be nailed to the edges of the foot piece the better to keep the ends of the mopsticks steady and immovable even when subjected to pressure outwards or inwards, or any blow.

Another mode of making trellis with mop-stick.

469. There is, however, another way of making trellis work with mop-stick moulding, which I like better than the method I have just described. It is more troublesome and takes much more time to carry out, but on the other hand it is far more ornamental and effective. First make a plain trellis of $\frac{1}{2}$-inch laths, halved together as shown in part A in Fig. 246. Make this in panels, and fit it into grooves formed by nailing slips to standards as in the preceding example, and put your mop-stick moulding on one face of this as shown in the part B, leaving the other side plain, if it does not often come into view, but, if it does, treat the other side in the same manner, overlaying it with mopstick moulding. The moulding, as the reader will notice on looking at that portion of Fig. 246 which is thus overlaid, must be neatly and accurately mitred together: but there is no difficulty in doing this with a mitre-box provided with proper fences, and a fine dovetail saw. Any number of mitred pieces of moulding may be quickly sawn; and the work, after the home carpenter has got broken into it as it were, will go on more quickly than he may anticipate, although it may be a bit troublesome and take time. But then, as I have hinted, the labour will be forgotten in the effect produced, which is excellent.

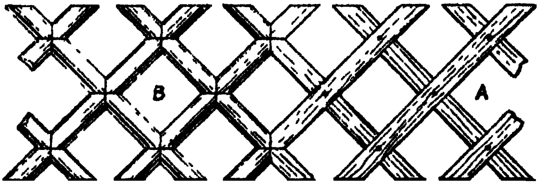


FIG. 246. Plain Trellis Work overlaid with Mopstick Moulding.

Mitre-box and mould combined.

470. "What sort of a mitre-box am I to use?" the amateur wood worker will ask. Ah, well, I thought the question would be put, and I am duly prepared to answer it. Fig. 247 will tell you all about it, and show you how to make it. In this A B D C is a rectangular board, whose edges A B, C D, are truly shot and parallel, D and E are two fences or guides equal in size, with parallel edges, and these are screwed down to the board as shown, leaving a central channel or groove between them, rectangular in section and equal in width to the diameter of a mopstick. In the fences D and E diagonal saw cuts are made in the direction of the compound solid and dotted lines A F, C G, the solid parts indicating the saw cuts

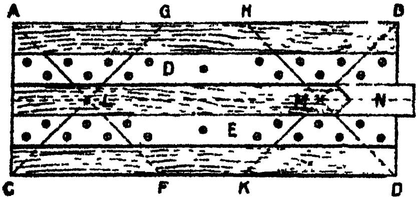


FIG. 247 Combined Mitre Box and Mould for Making and Cutting Pieces of Mopstick to proper Shape and Length

through the fences. These cross each other exactly and accurately at right angles in L, which is on the central line of the channel between the fences. The same is done at the other end in the lines B K, D H, which cross each other in the central dotted line at M. This is so managed that L M from corner to corner is exactly the length of the pieces of mopstick required to overlay the plain halved trellis. The piece N, which is notched at a right angle at the inner end, slides stiffly between the fences. When it is in the position shown in the diagram, a piece of mopstick is pushed up as far as its outer projecting corner, and the end is cut as shown by the dotted lines at M, by passing the dovetail tenon saw diagonally through the saw-kerfs shown in the fences in the solid lines in B K, D H. The piece N is then pushed forward until it meets the piece of mopstick already mitred, and there it remains, as, after the first end in any length of mopstick has been cut, there is no more cutting to be done at that end. It will be noticed that the sides of the notch in N are at right angles, and when pushed forward, coincide with and are in continuation of the solid lines through the fences in the direction of the lines B K, D H. Saw cuts are then made across the mopstick through the solid lines in the fences, in the direction of the solid lines A F, C G. By these two cuts the other end of the first piece of mopstick is mitred and finished, and one end of the second piece is already formed. This end is then pushed forward in the central channel till it meets and butts against N. The cross saw cuts at L are then repeated, and the second piece is complete, and the third piece is commenced, and so the work goes on until the first length of mopstick is cut up. Then N is drawn out to allow the square end of the second length to be brought up, and the process is repeated until as many pieces of mopstick have been cut as may be wanted.

Cutting pieces of mopstick.

471. The value of halved trellis made as described as a foundation for mopstick mitred trellis work is great, and the uses to which it may be put are numerous. Nothing, for example, is better than a tolerably close trellis made in this way for the false floor of a bathroom. It should be made in pieces of suitable size, and the pieces fitted together, so that they may be easily taken up when it is necessary to wipe or wash the boarded floor of the bathroom. If made of slips 1 inch square, they should be laid on two or more

slips of the same width and from ½ inch to 1 inch in thickness, to form a space between the surface of the floor and the lower surface of the trellised false floor. The comfort of the bather on stepping out of the bath is thus assured. Trellis work thus made in long and narrow strips is also most useful and desirable in a conservatory or green house which is paved with stone, slate, or brick, or has a concrete floor; for after syringing and watering copiously, the strips may be laid down on the paving, so that it is possible to walk all round it even in slippers without coming in contact with the wetted floor. It may also be made available in this form in stables, or, indeed, in any position and under any circumstances in which it is desirable to avoid contact with a copiously wetted or even damp paving below Stone, it must be remembered, like metal and especially iron, is a good conductor; and, as such, rapidly absorbs and carries away the heat of the body, and hence its coldness to the touch. Wood, on the contrary, is a bad conductor; that is to say, it is warm to the touch, because it does not absorb and cause rapid withdrawal of the natural warmth of the vitality. Diminution of animal heat through sitting in a current of air, popularly called a draught, when carried to too great an extent, lowers vitality, and induces that which is familiarly known as catching a cold, whereas it is the cold that catches us.

Halved trellis work in bath-rooms, green-houses, etc.

472. We are now brought to a very interesting part of our subject—namely, the manufacture of ornamental trellis; that is to say, trellis work in forms other than that of the ordinary character, namely, laths crossing each other diagonally at any prescribed angle, which generally varies from an angle of 60° to that of a right angle, or 90°; the lower course of laths being put in the framing itself, whatever it may be and in whatever position it may be in one direction and the upper course in the opposite direction, but at the same angle to ensure regularity of appearance. This, with the great majority of trellis makers, appears to be the *ultima Thule* of all trellis work—its most northern parallel of latitude, beyond which it is impossible even for the most adventurous of constructors to go; still, as far as I am concerned, I have got a little further due north than this; and if I have not reached the North Pole, beyond which it is impossible to go, still I have got a little nearer than other workers, as I think they will allow when they have read and duly considered the pages now about to follow and the illustrations that are given therein.

Ornamental trellis of various kinds.

473. I have described my auricula house over the dustbin in a previous chapter, and I have briefly spoken of the trellised panels that I placed therein.

Trellised panels in auricula house

Frame for panel

I will now give illustrations of these panels and explain the mode of construction that I adopted and followed in making them. Of these panels there were three—two of the pattern shown in Fig 248, and one of the pattern exhibited in Fig 250 As may be supposed, the latter was the central panel and the other two flanked it, one of them being on each side Of course, the pattern given in Fig 248 seems easier to make than the other in reality, one is just as easy to make as the other, but we will consider this all in due course Let me first explain that I had three perfectly square openings to fill, each of them 1 foot 9 inches square including the rebate, or 20 inches square exclusive of the rebate, seeing that the slips or rather projecting pieces that lapped over the openings and against which the panel had to butt and rest, extended just ½ inch all round beyond the original opening I had therefore, first of all to make a frame for the panel, and this I made of stuff 1½ inches square, so that ½ inch in width all round was hidden by the rabbet, and 1 inch in width was visible, thus assimilating the width that was shown to the width of the material used for the rest of the panel, which was made of planed up laths, 1 inch in width and ½ inch thick I made the frame of two standards and two rails halved together at the corners, as shown in Fig 248 I had resolved to make a centre surrounded by four oblong panels disposed round the central panelling or opening, and arranged according to the manner usually adopted for doing these things in so-called Japanese or Japanesque furniture and decoration My first care was to arrange the size of the openings *within* the frame, and as the main opening was 18 inches square, a little thought and a few figures soon showed me that as my bars were to be made of stuff 1 inch in width, after deducting 2 inches for the width of the main bars forming the framing of the central opening, I could allow 4 inches for

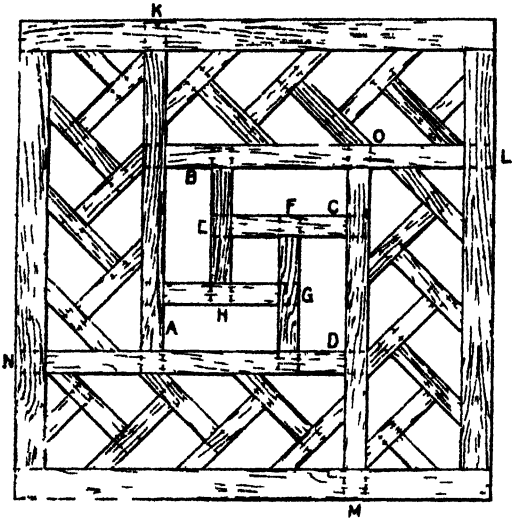


FIG 248 Ornamental Trellis Panel in Auricula House

the width of the four subdivisions that surrounded the central opening, and 8 inches for the width of the central opening itself.

474. This was further helpful in another particular, for as 4 and 8 are multiples of 2, it enabled me to determine on 2 inches as the width between adjacent laths in all parts of the panelling—a convenient arrangement, as the reader who attentively considers and measures the panel will find; and this he may do readily, as Figs. 248, 249 are drawn on a scale of 1½ inches to 1 foot, or ⅛ inch to an inch - a good scale to follow for all general purposes, because it can be easily worked from a common two-foot rule, which is graduated in inches, ½ inches, ¼ inches, and ⅛ of inches, and in these only Having determined my dimensions, it was an easy matter to go ahead. I did not trouble to make any working drawing; for although I always strongly advise and urge amateur wood workers to do so, I very seldom resort to this myself except in matters of extreme difficulty, involving complexity of construction to a great extent, or when I have some new arrangement to work out and put my work on paper, so that my mind may have the aid of ocular demonstration, instead of carrying the whole thing in what is styled the "mind's eye". So first of all I took lengths of laths marked as A, B, C, and D, in Fig. 248, about 18 inches long, and I took them thus over long because in working trellis of this kind in halved joints, it is better to notch your stuff when you can by making two saw cuts at the proper distance from each other, and clearing out the wood between with a chisel to the proper depth, instead of sawing a piece out of the end to drop into a notch of the kind described in the adjacent piece; a mode of procedure which often leads to the splitting of the thinned end when it is pierced with a bradawl for the reception of the screw. The holding power of the grain of the wood is so weakened by the notching or thinning down that a very little lateral pressure tending to drive the wood apart in the way of the grain splits it, and leads up to labour lost and the purchase of a little experience at its cost.

Filling of central opening.

Treatment of halved joints.

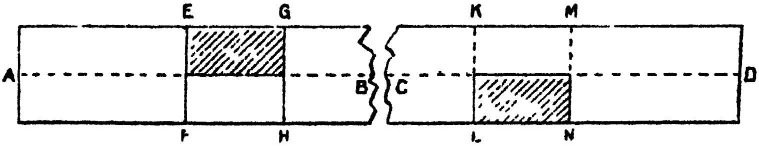


FIG. 249. Diagram showing Safe Way of making Halved Joints in Thin Material.

475. My meaning will be clearly shown by Fig. 249, which represents the side elevation of two pieces of wood ½ inch thick, to be jointed by halving.

A lesson in notching for trellis work.

The first thing to be done after planing the pieces—and it is better to do this in long lengths from which to cut the shorter pieces as required—is to set a marking gauge to ¼ inch, and half the thickness of the material, and mark lines with the marking point on each side of the material, so as to determine with accuracy the exact depth of the saw cuts. Then mark with square and pencil the extent of the notch, which will be 1 inch in length, in correspondence with the width of the material on the sides and top or bottom surface of the material itself I say *top* or *bottom*, as the case may be, designedly; because it is better to distinguish the surfaces in this way, so that you may be able to cut your notches accordingly, so as to drop one piece over and into another without making any mistake, such as cutting one notch one side, and another notch which ought to be on the same side as the first notch cut on the other side, thus involving further loss of labour and purchase of experience. Having marked the wood as described, make the saw-kerfs, using a small thin dovetail saw in preference to any other, this being the finest and smallest kind of tenon saw made. These saw-cuts in Fig. 249 will be along the lines E F, G H, K L, M N, to the depth indicated by the horizontal lines A B, C D. Clear away the shaded parts in each with a sharp chisel, doing this part of the work with the utmost care. You have then a notch made in each piece, with a projecting end or horn at A and D. Fit the notched pieces together, bore a hole for the reception of the screw, countersinking for the entrance of the head with a small rose bit, such as is usually found in a shilling pad, with bradawls, small screwdriver or turnscrew, reamer, etc., and then fasten together with ¾ screw. When making the saw-cuts, be sure to make them in such a way as to leave the pencil marks visible when the notch is cleared out. By doing this you get the nicest accuracy of fit; and if the joint is so tight as to cause injury by forcing one piece into the other, it is always an easy matter to ease the sides of one or other of the notches; whereas if the fit be loose, and the pieces wobble about one within the other, there is nothing to be done but to pack the notches with paper or thin cardboard, which is at the best a sorry and unworkmanlike procedure.

Fitting central framing to main frame.

476. My next care was to determine with accuracy the position of the notches in the main frame at K, L, M, N, to receive the outer ends of the pieces A, B, C, D, that composed the central framing. These—as the main frame was made of bars 1½ inches square—I cut ½ inch in depth, so as in no way to weaken the ends of the pieces named; and having fitted them into the notches made for their reception, I proceeded to put the pieces E, F, G, H, into the central

framing in the manner already described, leaving projecting horns in every case. I got everything ready for screwing up, even to boring holes for the screws and countersinking, but I did not finally fix the parts together with the screws, except the four pieces already named, on account of the difficulty that exists in cutting notches for other parts and determining their position if the central framing is screwed to the main frame before the whole of the notching is done. I did go so far as to screw the pieces E, F, G, and H together at the notches so lettered; but I did not go any further than this. It will be noticed on making measurement that the opening in the very centre is precisely 2 inches square, and that the oblong openings that surround it are respectively 5 inches by 2 inches. Moreover, the distance between the parallel laths or pieces in the opening surrounding the central framing is exactly 2 inches.

Filling up oblong side of openings.

477. To manage the filling up of the first of these pieces was by no means an easy matter. It would have been easier to have made a full size template in cardboard, and to have laid this on the central and main framing, as I could then have determined the places for the notches without much trouble. As it was, I stretched a cord along the central line of the openings longitudinally, and then to make trial by pieces of lath, until I get it tolerably accurate, so as to get the lines of notching on each side equidistant throughout at their outer points, from the inner edge of the main frame and the outer edge of the opposite arm of the central framing. I never thought of the pasteboard template as I have said, nor did it occur to me that I might have jointed successive pieces at right angles to each other, at intervals of 2 inches in the manner shown, and then to have laid the branching piece thus formed on the main frame, and the arms of the central frame in order to determine the position of the whole with ease. But, as I have said before, one cannot think of everything all at once; and in many cases, it so happens it is just when you have accomplished a piece of work with some little difficulty and trouble, that the best and easiest way of arriving at the end in view occurs to you. If you look at the part of the diagram (Fig. 248) lettered O, you will notice that an end of a diagonal piece enters the central framing just where the arm C enters the arm B. All that can be done in this case is to cut the square end of the arm C, when the horn has been removed in such a manner as to admit of the entrance of the end of the diagonal arm. It was in order to meet difficulties of this kind in the easiest possible manner that I did not do more in the screwing together, till everything was finished in the way of fitting; and it is to save trouble in this respect, that I counsel the trellis-maker to restrain his anxiety to screw the parts

together, until every joint be fairly and accurately fitted. The end of the fitting will come at last, and then he may screw the parts together, removing the horns as he proceeds, and when the last screw is driven home, he will have the satisfaction, as I had, of handling a firmly made and solid panel, and trying it into the opening for which it has been made.

478. I have said that the side openings or openings on each side of the central opening were filled with two panels of the form just described. When I had made these, I thought that a little variation from the form I had adopted would be desirable; and a little thought soon showed me that the variation I desired might be found better in a change of position than in change of shape. It is wonderful to note the alteration that is frequently effected by a simple change of position only. Looking at Fig. 250, the amateur wood worker will be disposed to regard it as a stiffish job; but if he turns the page to the right until the diagram is placed diamond-wise, he will find that the whole of the central part of the panel has to be made in precisely the same manner as that shown in Fig. 248, and the only difference in making it will be that he must use pieces of ½-inch stuff for the parts A, B, C, D, which were previously occupied by portions of the main framing, and which will now be substituted for the thicker framing. The best mode of procedure is to make the panel as previously described with this difference only, and having jointed the parts closely and firmly together, to lay it on the main 1½ inch square framing, as shown in the illustration; and after marking the position, to cut notches ½ inch deep in the main framing for the reception of the arms. The only additional work that has then to be done is the insertion of the pieces in the corners at A, B, C, D, in the manner shown. The only difficulty that will occur will be in the fitting together the ends of pieces that may coincide in position, or nearly so, in the parts A, B, C, and D; and this must be managed in the manner already described. In order to prevent splitting as much as possible

Formation of alternative panel.

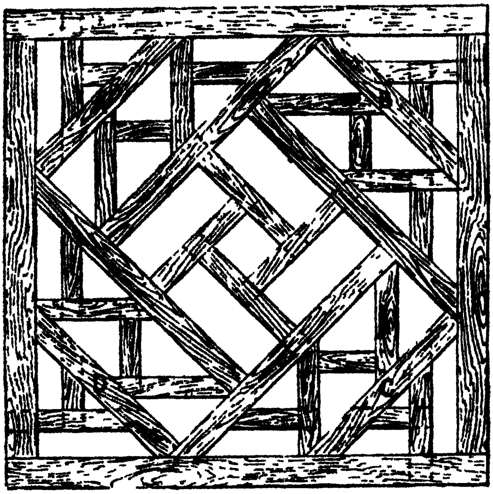


FIG 250. Alternative Ornamental Trellis Panel in Auricula House.

when previous removal of the horns is unavoidable, pack the adjacent ends as tightly together as possible before boring holes with a bradawl for the reception of the screws, and when boring the holes make sure that you are inserting the chisel-shaped end of the bradawl transversely to the grain of the wood; this tends to prevent splitting better than any other mode of managing this matter. and should always be followed; and, more than this, the amateur wood worker should do his best and utmost to see that the bradawl is inserted at right angles, and not at an inclination to the surface of the wood, as this is very often a fruitful and fertile source of splitting, especially in small work such as we have been dealing with now. I may add that I kept these panels tightly in place when painted by the insertion of tiny wedges between the panel and the sides of the opening in which it was placed. Such panels as these will be found both useful and ornamental in many places and positions in which such work is found to be desirable or necessary, and may be made to suit openings of any size by suitable variations in the dimensions, either of openings or material.

479 And now we pass on to the construction of another panel, namely, that above the entrance to the auricula house. This is shown in part in Fig. 251, but I may say that the termination to the right hand is precisely the same as that which is shown to the left hand. It is drawn to the same scale as the panels shown in Fig. 248 and 250, namely, on a scale of $1\frac{1}{2}$ inches to 1 foot, or $\frac{1}{8}$ inch to an inch. In this case there was an opening of the same kind as those on which the square panels were inserted; but there was just this difference, that the rabbet was behind the panel, instead of in front; and that, therefore, the framing was made in material 1 inch in width and $1\frac{1}{2}$ inches deep, so as to obtain similarity of appearance as far as possible. Further, I adopted a different mode of construction for this panel, which I found to be a very useful one for all panels of an ornamental character when the work was straightforward, and it could be adopted with safety. My plan

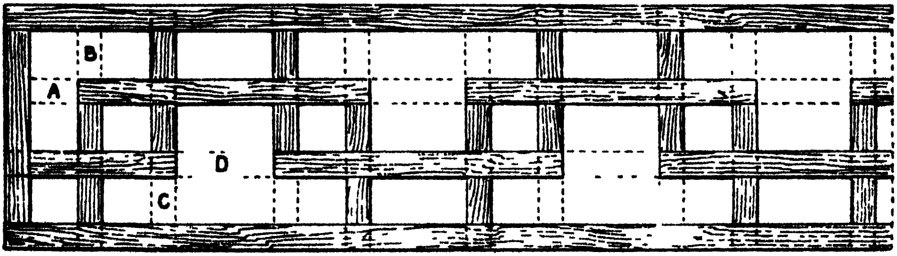


FIG. 251. Ornamental Trellis Panel over Entrance to Auricula House

was well fixed in my mind, and as the material was the same in breadth and thickness as that which was used for the other panels, I had no difficulty in settling the dimensions. Having made the frame, which, at all events, was 10 inches in width, although I do not precisely remember the length, but, as far as my memory serves me, I believe it was 3 feet or rather less: in which case I have made my drawing rather too long if it were completed. I found, after allowing for the width of the framing, that there was 8 inches between the upper and lower rails of the framing, which gave me room for two bars or rails 1 inch wide, and openings 2 inches in width between upper and lower rails of frame and intermediate rails. Having marked these spaces on each side of the frame, I proceeded to cut the notches as before in the front of the frame; and I fitted the two intermediate rails into the notches in the sides of the frame, leaving horns slightly projecting beyond the frame itself. I then proceeded to mark out spaces, or rather notches, to receive the vertical bars, leaving 2 inches space between the sides of the frame and the first and last bar, and 4 inches between each pair of bars throughout. I next took pieces of suitable length, and cut notches in the top and bottom rail to receive them; and taking out the horizontal rails, I cut notches in them at the proper distances from behind, and then I notched the vertical rails from the front, carefully adjusting them until I got the whole nicely fitted together. I then bored the holes for the screws, and screwed vertical and horizontal laths together and both to the frame in the notches cut for the reception of the ends; and then I had before me an ugly-looking piece of squared trellis work, irregular to a certain extent in openings and distances between vertical rails, and in no way to be desired for its beauty. I knew, however, what I was about; and having carefully marked the unshaded parts of the laths, as showed between the dotted lines A, B, C, D, I proceeded to cut them away with a fine dovetail saw. This, as may be supposed, was done very rapidly—so rapidly, in fact, that the transformation effected seemed almost magical, and that the tenon saw possessed the power of an enchanter's wand. As piece after piece fell quickly to the ground, the trellised form, as shown by the shaded parts of the laths in Fig. 251, quickly came into view, and amply satisfied and rewarded me for the labour I had expended in its construction. Many a carpenter has asked me how that piece of ornamental trellis was made, and if I did not find the making of it tedious and troublesome; and he has smiled to himself and quickly nodded his head in approbation when I have told him of the simple means by which it was effected.

Ornamental trellis panel over entrance to auricula house.

New forms of ornamental trellis.

480. But to go at full length of description, and into detail with regard to much of the minor ornamental work that I put into my auricula house, would cause this volume to swell to proportions that would suit, I fear, neither publishers nor purchasers; and I must hasten onwards to show other forms of ornamental trellis work which the amateur wood worker may find suggestive, if not such as he is inclined to adopt in his work. Thus the ornamental trellis shown in Fig. 252 is altogether a new form—at least, I believe it to be so and original. It has the merit of being at once easy to make, satisfactory certainly to the eye and marked in character It is suitable for panels of any form and for borders of the kind shown in Fig 251. It is composed entirely of vertical and horizontal pieces, and presents no difficulty in jointing into the main framing or in putting the several pieces together. A specially distinctive feature in it is the Latin cross shown in the centre. This feature would be lost if the lower rail of the framing for a long panel or a border were carried along from A to B, as shown by the dotted lines; but retained if the top and bottom rails of the framing were carried along from C to D, and from E to F respectively, or even from G to H and from K to L, in which case the rails of the framing would form the top and bottom of the cross. It would look equally effective as a panel if it were worked into a frame diamond-wise in the same manner in which the work shown in Fig. 248 was so turned, and used diagonally in Fig. 252. Treated thus, it would be desirable to take the lines M, N, O, P, as the inner edges of the framing; but as a panel everything between the dotted lines P, Q, R, and S, should be included. These lines would be found to run diagonally through the centre of the parts of crosses shown at the upper right-hand and lower left-hand corners of Fig. 252. Turned in this way, the cross, which through its position represented a Latin cross or St. George's cross in Fig. 252, would when turned as suggested represent a saltire, or

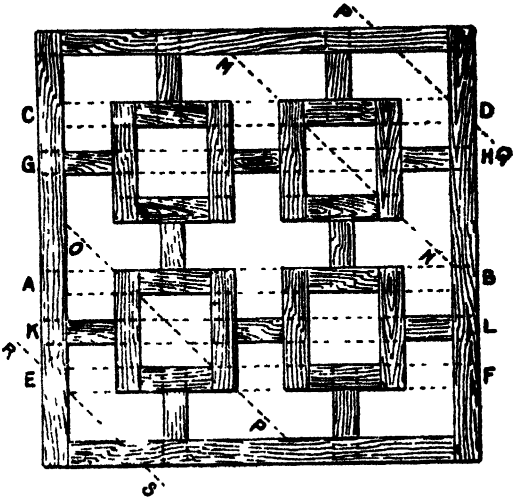


FIG. 252. Ornamental Trellis for Panels, Borders, etc.

Panels of cruciform character.

St. Andrew's cross. I call attention to this to show how easy it is to arrive at that which is apparently variety of treatment by a mere change of position.

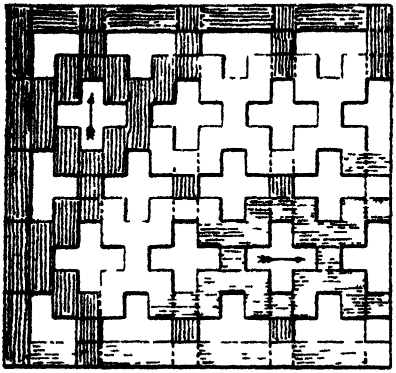


Fig. 253. Ornamental Trellis of Cruciform Character entirely

481. It is possible, as I have endeavoured to show in Fig. 253, to form a piece of ornamental trellis in which the Latin cross alone appears without the intrusion of any other form. It would be difficult, but it would be possible; and the difficulty would be in the fact that it would be necessary in a great measure, if not wholly, to carry out the work on a full size working drawing, using laths 1 inch in breadth and ¼ inch in thickness, cut in short lengths of, say, 3 inches, 2 inches, and even 1 inch That the trellis presents unusual difficulties
How made. of construction, I am well aware; but, for the benefit of any one who is inclined to attempt the work, I will tell him how I should do it after having provided myself with pieces of material as described. Having stretched my paper—which should be as thin and as tough as possible—on a large drawing board, I should then proceed to make my full-size working drawing, defining the outline by clear sharp lines, and I should then tint all the parts to be filled in with wood with a wash of Indian ink or sepia, leaving the crosses white. I should proceed to lay in the bottom tier of pieces horizontally, as shown in the lower right-hand corner, using pieces 3 inches in length as much as possible, putting in single pieces 1 inch square to fill up where absolutely necessary. I have indicated the direction of these pieces by a horizontal arrow in one of the crosses. I should complete this lower layer first of all, attaching the pieces to the paper itself by a thin coat of waterproof glue, which I have mentioned before in this work, and which is used cold I should also use mahogany or cedar in preference to any other kind of wood. The pieces should be cut as truly and accurately as if for mosaic work, and if the edge of any piece wanted a little trimming, I should effect this by rubbing it on very fine sandpaper. Fill the whole space up, altogether ignoring the framing. Having completed this first layer, I should proceed to put in the upper layer, gluing each piece down to the lower layer, weighting the work as I went on to ensure adherence of the pieces composing the two layers. These pieces would all be placed

in a vertical direction, as shown by another arrow in a cross in the upper left hand-corner in Fig. 253; and these pieces I should work in lengths of 3 and 2 inches. I should carry the pieces well out beyond the outer limits of the frame. On completing the upper layer I should place a sheet of pasteboard all over the surface of the topmost layer, and on this put heavy weights. When thoroughly dry I should rub the surface of this layer with very fine sandpaper, so as to obtain an even and perfectly uniform surface throughout. Then, having released the paper from the board and cut out the cross with a sharp penknife, I should clear away the paper adhering to the wood by means of sandpaper, and render the face of the lower layer as clean as that presented by the upper surface. This done, I should form a framing on *both* sides by gluing on pieces of the same material 1 inch wide and ¼ inch thick, either mitring them at the corners or squaring them up after the manner of styles and rails, as my choice might ultimately determine at the time of doing the work. But when made, it could not fairly be regarded as a trellis suitable for garden work. It would rather be a trellis for indoor decoration for a fire-screen or any similar purpose: and a sheet of ruby glass, or glass of any other colour preferred, might then be fitted in on one or both sides of the wood work panel, to complete its character as a screen.

482. I will give two more forms of halved trellis work suitable for outdoor decoration, and then I will hasten to the end of this chapter. These forms are shown in Figs. 254 and 255, and, like most of the other forms that I have figured here, they possess the charm of novelty. They are in no way difficult to make: they may appear so, but on proceeding to copy them in wood the home carpenter will find that in reality they are not so. In the position in which I have placed the illustrations, they give the idea of arrow-heads running in contrary directions. The designs may be used with the points of the arrow-heads disposed horizontally as shown, or running vertically upwards and downwards. The general effect of the trellis in this position

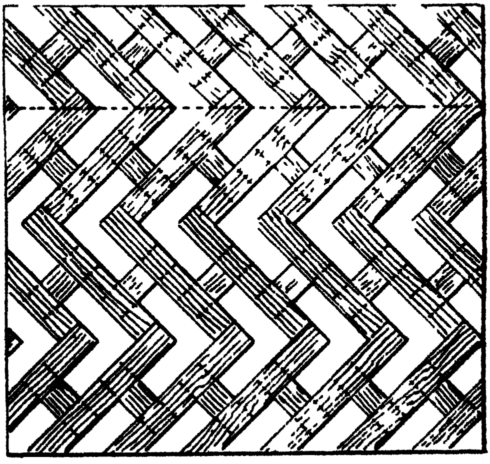


FIG. 254. Ornamental Trellis Work of "Arrow-head" Character.

may be seen by turning the book half round so as to bring the diagrams in this position. In mode of construction these in no way differ from most of the trellises of ornamental character described in the preceding pages The parts are all halved and screwed together, and the trellises themselves are equally well adapted for panels or borders as may be desired. I have not shown the frames in these illustrations, as I desired to do nothing more than to exhibit the character of the trellis. I will, however, recommend the amateur wood worker, if he resolve on making trellis of this description, to regulate his work in such a manner that exactly one half of a line of arrows shall come next the framing—against the top and bottom rails, where the arrow-heads are disposed horizontally, and against the styles or side pieces when they are disposed vertically. I have indicated the starting point in each diagram by a dotted line The panel may be completed on the other side by a line of semi arrow-heads, running in the same direction or in the contrary direction, according to convenience. In any case, however, if practicable, I would recommend the home carpenter to have an odd number of rows of arrow-heads, so as to get a marked central line; and in this case the half line must run in the same direction at top and bottom. This, however, is entirely a matter of convenience, as I have already said; and the wood worker must be guided by circumstances dependent mainly on the length and breadth of the space to be filled. The points of difference between the two forms shown are too obvious to require any remarks on them from me.

Trellis of arrow-head character.

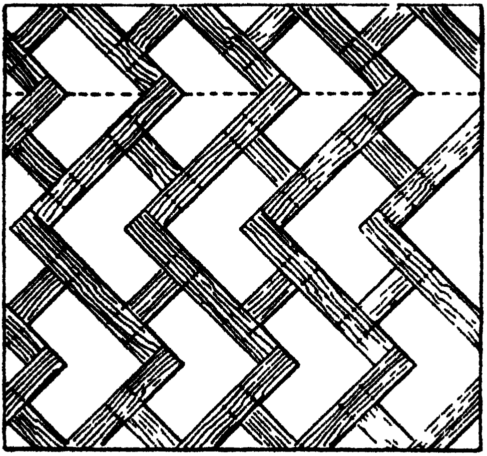


FIG. 255. Alternative and More Open Form of Trellis Work of Arrowhead Character

483. I now come to the last piece of ornamental trellis work that I intend to describe This, from its general appearance and its elaborate construction, I am inclined to call "Trellis Royal". I have given a sketch view of it, exhibiting its *tout ensemble* in Fig. 256; but for the better guidance of the home carpenter I have shown the parts in detail, on a scale of 1½ inches to 1 foot, in Figs. 257, 258, and 259. The trellis

"Trellis Royal."

work itself consists of three distinct parts, which correspond to dado, central part, and frieze in wall decoration. I felt inclined at one time to cover the lower part of my house with a continuous trellis on which to train climbers of a perennial character. The brick work was not in the best condition, and I did not care to go to the expense of repointing the entire front of the house; so I hit on this mode of taking off the attention of the passers-by from the state of the brick work, by giving them something better to look at in the form of trellis work On consideration, as it would run to some height, I felt that the old style of trellis work spread over so large an area for it was a double-fronted house -would look very monotonous; so I devised the trellis that I now present to the notice of my readers. There were two square bays in front of the house with a small verandah between them over the front door; so that, after all, there were but six panels to make, of which four were long and narrow, like that shown in Fig. 256, and the remaining two large in themselves as a whole, but broken in the central part by the windows of the dining-room and drawing-room. This led me to the division of the trellis work into three parts, separated one from the other by two bands, and furnished by other bands similar in construction at top and bottom, **Construction.** which should run continuously all along the front of the house. The proportions of frieze, central part, and dado were as a matter of course regulated by the building itself, and dependent on the height of the window sills above the ground, the height of the window, and the distance between the top of the window very nearly to the sills of the windows on the first floor; and this must be the case with regard to every house for which this trellis work may be

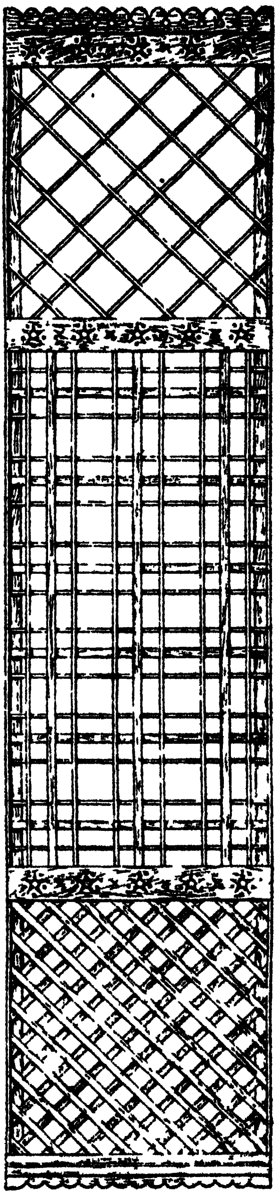


Fig. 256. Sketch View of "Trellis Royal," showing General Appearance in Complete Form

made. I am merely seeking now to show the principle and mode of construction; and as a general rule at starting, let me say that the opening at A in Fig. 257 should form the centre of every panel in the frieze, whether the distance above and below is longer or shorter, or the width on each side to the battens to which the laths are fastened is wider or narrower. The same rule should be applied to the construction of the central part, the centre of the panel itself being at A, A′ in Fig. 258; and

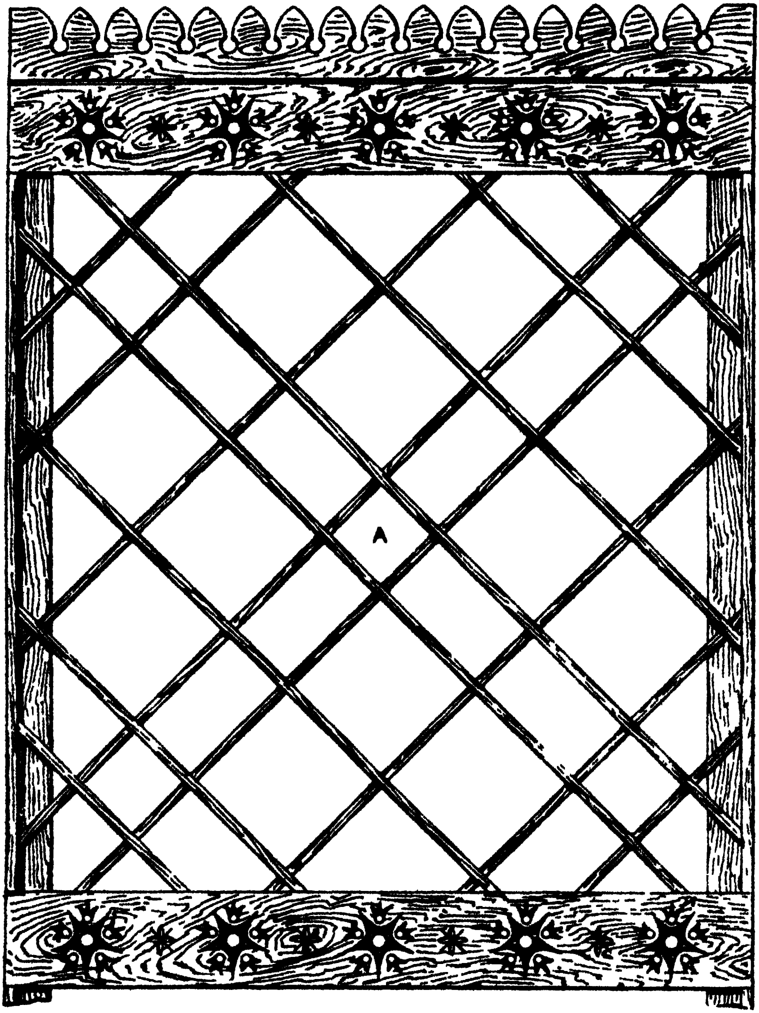


Fig 257 Detail of Frieze of "Trellis Royal".

similarly the central vertical line of panelling in the dado part is that which is indicated by A in the third opening in the line, reckoning from the top. With regard to the construction of the panels themselves, they are made of laths 1 inch in width and ½ inch in depth, and they are halved into each

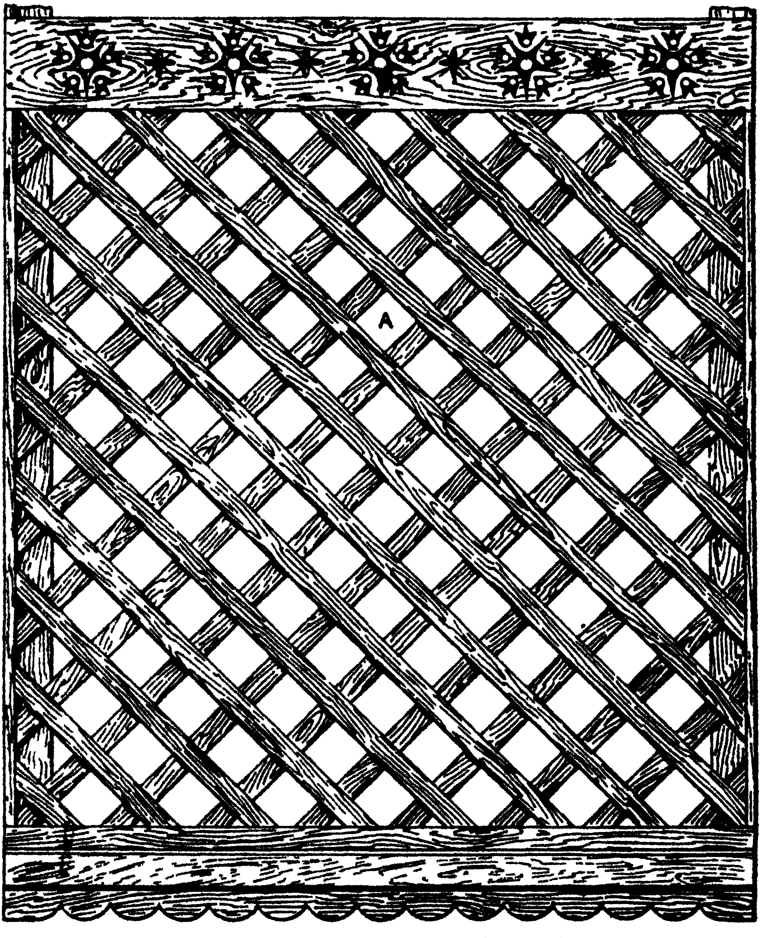


FIG. 259 Detail of Dado of "Trellis Royal".

other at every crossing, so that the panels themselves are flush throughout at back and front Each panel should be made independently, and fitted on to the framing afterwards; and this mode of procedure renders it all the more easy for the home carpenter to regulate the centres and central vertical lines of the three parts. I should further explain that there is a regular graduation of material as well as a change in pattern from bottom to top. The bottom is made entirely of 1-inch laths, arranged diagonally at right angles; as shown in Fig. 257, the central portion is made partly of laths 1 inch by ½ inch, like the lower portion, and partly of laths ½ inch square, formed by ripping some 1-inch laths longitudinally down the centre, and they are

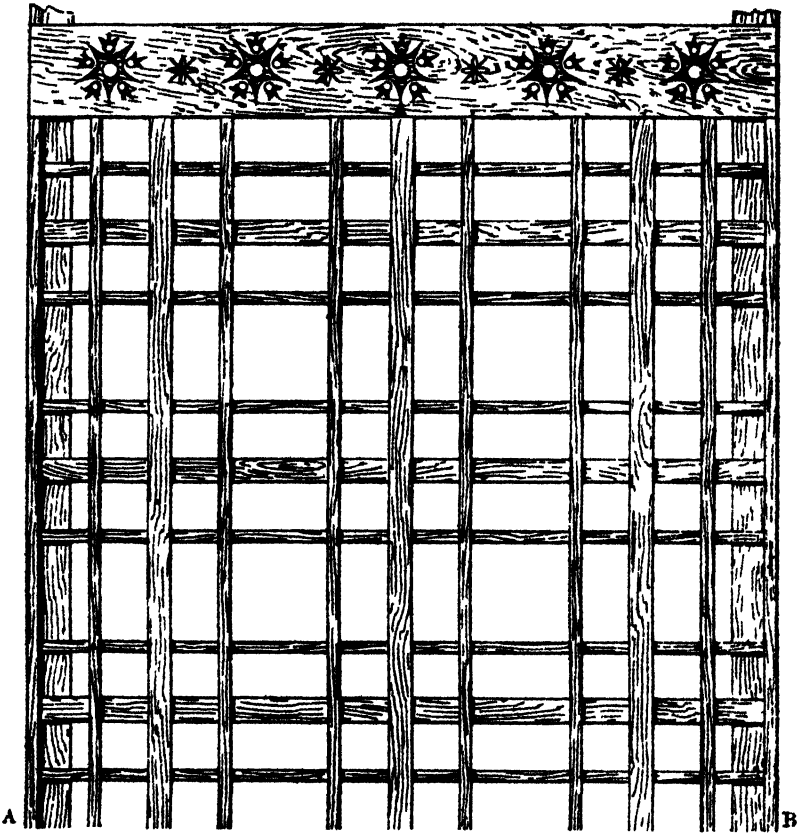


FIG. 258. Central Compartment of 'Trellis Royal' Upper Part Correspondence and Continuation of Parts shown by Letters A A, B B

arranged vertically and horizontally in such a way as to form a chequered pattern somewhat after the manner of the tartan of many a Scottish clan. The frieze is formed entirely of laths ½ inch square, arranged diagonally, and also forming in its arrangement a pattern of this kind. The bands are in themselves made of ½-inch stuff, 4½ inches wide and slightly chamfered at the edges. They are pierced with circular holes, made with centre bits of two different sizes, the larger holes in the centre of

Graduation of pattern and materials

each ornament, with five smaller holes surrounding it The larger hole has then five rays proceeding from it, incised with a chisel, and from each smaller hole three incised rays proceed in the manner shown At the bottom of the dado a plain band is used, scalloped at the lower edge as **Bands** shown, but to redeem it from entire plainness and lack of ornament, two

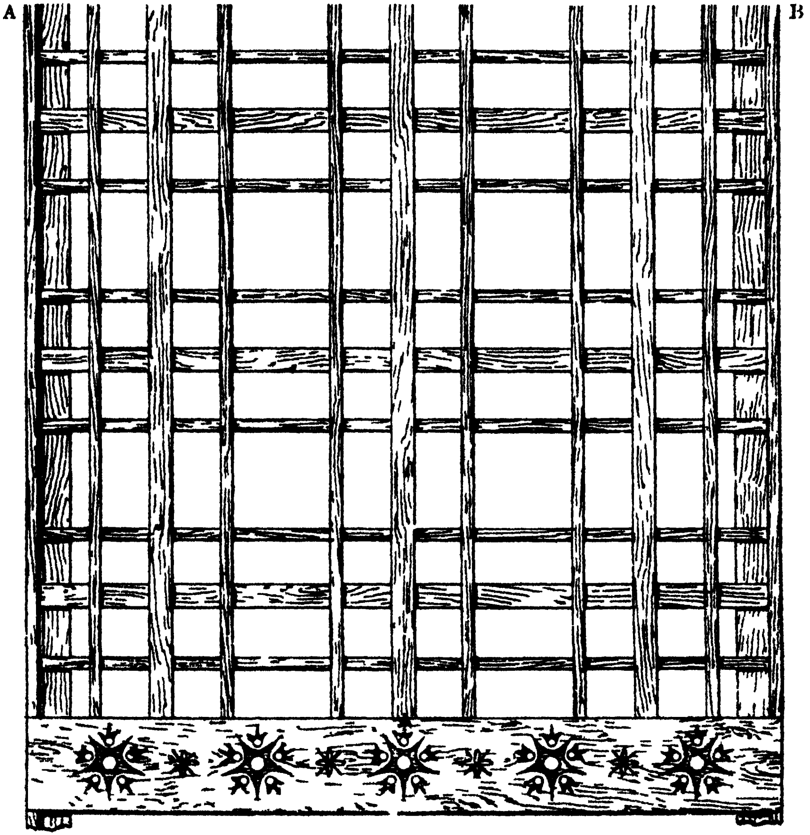


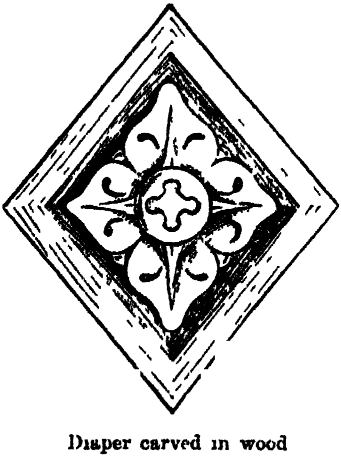
FIG 258 (*continued*) Central Compartment of Trellis Royal Lower Part—Correspondence and Continuation of Parts shown by Letters A A, B, B

fillets are nailed across it horizontally in the manner shown in Fig 259 The bands are merely repeated in the three illustrations in detail, to give finish to the diagrams and to show connection Above the topmost band a cresting is placed by way of finish to the whole

484 Let us suppose that the panels, bands, and cresting are all made, and that nothing now remains but to put the parts together Two battens, 2 inches wide and 1 inch thick, are now taken and planed up, and a strip of

Fitting parts of trellis together

stuff ½ inch square is nailed along the outer edge of each. Temporary pieces of wood are then nailed to the back of the battens to regulate their distance apart to the width of wall that the trellis is to cover, and to keep them equidistant and parallel throughout. The position of the four bars is then marked on the ledges on which they rest when fastened down. The panels are next placed on the ledges, and lines are marked along the laths with a straight-edge, and the ends sawn off, so that they may drop readily into their places on the battens between the ledges. The sides of the panels are then nailed to the battens, and they are then cut in an even line at top and bottom, so as to cover the bands within for about an inch. The bands are then screwed down to the battens, small blocks being placed below the ends, to give them a better and firmer bearing. The whole structure is then turned over, the temporary pieces are knocked away, and the laths of the panels are fastened to the bands from within. The trellis work, now entire, should be painted, and finally fixed in its place with holdfasts. This fixing is the end of the procedure, and crowns the work. And now I have done with trellises, and aught else concerning them, except by mere allusion. I trust that the reader has not been wearied by my descriptions of trellis work *in extenso*. If so, he must forgive me for being possessed of what the French style "excess of zeal" for this kind of, to me, most attractive and alluring ornamental work.



Diaper carved in wood

CHAPTER V.

WALL GARDENING, AND ORNAMENTAL STRUCTURES AND CONTRIVANCES SUBSIDIARY TO IT.

Wall Gardening: What it is—Buttresses as Foundations for Structures for Wall Gardening—Wooden Extension of Wall—The Wall itself—Fixing of Wooden Fencing—Boxes for Wall Gardening—Wooden Sub-Structure—Box on Top of Wall: How made—Box in Front of Wall—Trellis Work in Front—Rustic Mosaic on Sides of Supports for Boxes—Drainage of Lower Wall Box—Rustic Mosaic Work for Sides of Boxes—Rustic Mosaic Work for Fronts of Boxes—Horizontal Lines sometimes Detrimental to Appearance—Fan Ornament for Rails and Fences—The Fan: How made—Preparation of Semi-Disc—Plan for the Semi-circular Band—Making the Band—Preparation of Template—Cutting out the Wooden Arcs—Attachment of Band to Rail—Wood for Compasses—Fitting Legs of Compasses together—Fastening of Legs of Compasses at Top—Quadrantal Arc—Shaping Legs of Compasses—Finishing Legs at Bottom.

485. I WILL take this necessarily brief chapter on wall gardening and such appliances and contrivances as appertain to it next in order, because in one or two cases it involves the construction of trellis work in combination with them; and as trellis work in all its varied phases has been so recently brought under the reader's notice, it will be needful to do no more than advert to it as trellis work without any renewal of observations on its structure. And as some one may be disposed to inquire what "wall gardening" may be, I will begin with a few remarks on it. Every one, I suppose, knows what a wallflower is, and knows also that it takes its name from its peculiar habit of growing on the top of walls in any position in which the young seedling has been able in the first instance to find an anchorage for its slender roots, which will enter and thrive in any fissure from the scanty contents of which it can derive sustenance sufficient for the unexacting requirements of this plant. The late Shirley Hibberd once gathered seed from a wallflower that was growing on the wall of the garden attached to Shakespeare's house at Stratford-on-Avon, and distributed it to those who wished to have some, as the Shakespeare or Stratford wallflower, I forget which. I do not know if the strain is yet in existence; very probably it has died out, as many of these things do, and is now forgotten. The best explanation of what natural wall gardening is will be found in Fig. 260, which represents two of the upper courses of a wall formed of rough stone, and surmounted with a coping of stone of the same character, disposed in a double row with

Wall gardening: what it is.

pockets and interstices between them of various depths and sizes, which gradually become filled with *humus*, or decayed vegetable mould, in which plants and trailers, such as the wallflower, ivies, toadflax, and creepers, have vegetated or been purposely inserted, so as to form a coronal of flowers or floral cresting amid the rugged stones, and a vesture wherewith to cover here and there the surface of the wall itself, diversifying and brightening its neutral tints, whether those of grey stone, rough dark clinkers, or red brickbats, with brilliant colours of flowers and their attendant greenery. Such a top is easily made to any flat-topped brick wall, and deserves the attention of every home carpenter and amateur who likes and loves his garden.

FIG. 260. Natural or Primitive Wall Gardening

486. Now it may be, from the construction of the wall that surrounds the garden, or the material of which it is built, that it is not possible to do this; and it will be necessary to go to work with boxes or structures of wood of various sorts, shapes, and sizes. I will not detain the reader further than to describe one or two pretty and attractive features of gardening that I have carried out in this manner. *Ex uno disce omnes*, which may be roughly rendered, "From one of the sort you may learn to make all the rest". One of the most favourable opportunities for erecting fanciful and taking wooden structures is offered by the projecting buttresses of a wall which stands out from its face for the depth of 4½ inches, and is therefore what is termed ½-brick thick. The width of these projecting buttresses varies considerably. They are never, as far as I am aware, less than 13½ inches across horizontally, and more generally 18 inches, and even 22½ and 27 inches in width. Their height makes no difference whatever in the general appearance and utility of the buttress itself for this kind of treatment. My object is to make such an addition to the wall as shall completely mask the buttress itself and conceal it from view altogether.

Buttresses as foundations for structures for wall gardening.

487. Roughly speaking, this is best effected by a box on the top of the wall of the same width, or nearly so, with another of the same width in front of it, and having its top level with the top of the wall. It is easy enough to see how to support one box, namely, that on the top of the wall, but not so easy to see how the placing of a box in front of it, in and after the manner of a couple of steps, is to be effected. It does not matter whether there be any superstructure of wood on the top of the wall or not to add to the height of

the wall, and thus ensure a greater degree of privacy. In my case it was so; for as the wall belonged to me, I had put up a dwarf boarding about 15 inches in height along the top of the wall, consisting of standards at intervals of about 5 or 6 inches, with a rail at the base and another at top nailed to the standards notched into them, so that standards and rails on both sides were flush throughout. They were made, I should say, of quartering $2\frac{1}{4}$ inches by 2 inches. Then to the rails, boards 9 inches or 11 inches in width, and some even narrower, cut from such boards that had once formed a packing case, were nailed along the flush side of rails and standards, and the wooden fence in upward extension of the wall was ready. The fence thus formed was made in lengths; and as these were about 10 feet long, they were easily hoisted into the position they were to occupy on the wall. The boarding was so placed on the wall that the face of the boarding was flush with the face of the wall on the other side. Means of fixing it to the top of the wall were found by driving wood wedges between the bricks that formed the coping of the wall at suitable intervals, and skew-nailing through rails and feet of standards with long and stout wire nails. Thus secured, wall and fence were gripped together, and held one to the other "like grim death," as the phrase goes.

Wooden extension of wall.

488. I remember that the first length was 10 feet in length, with a standard at each end and one in the centre, and the rails notched into the standards at top and bottom. The first length reached as far as the buttress that was built in the middle of the wall, or in my case to the solid portion of the wall that separated recessed panel from recessed panel, the wall being of the kind described when considering the form and position of the dustbin and the auricula house. In fact, it was a part of the same wall against which these were built, and the first standard of the fence was bolted to the framing of the auricula house. The annexed sketch shown in Fig. 261, which is not to scale, but which is in good proportion, will enable the reader to comprehend the whole position and structure of panelled wall, in which the division between panel and panel forms a *quasi* buttress as below.

The wall itself

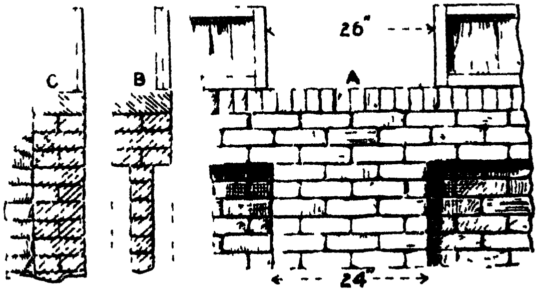


FIG. 261. Wall with Wooden Extension at Top. A. Front Elevation of Panelled Wall; B Section of Ditto, showing Panels; C Section of Buttressed Wall

A is the letter which indicates this part of the diagram as the front elevation of the wall at top of this part ; B is a section, the centre of the brick work below coping under B showing width or thickness of brick work through panelled part, and the space between the dotted lines showing thickness of framing of panel vertically, or, as I may call it, *quasi* buttress. C shows a section of a 9-inch wall throughout, strengthened by a $1\frac{1}{2}$-inch buttress, and how the top of the buttress is rounded off and the ends of the bricks built into the wall. The reader must note this, for the cheeks or flanks of the buttresses in either case play an important part in the fixing.

Fixing of wooden fencing.

489. I had put up and fixed the first length of wood fencing, as shown to the right of Fig 261, when the coincidence of the standard with the edge of the buttress below inspired me with a "happy thought" with respect to wall gardening by means of boxes attached to top and front of wall ; so I put up the next length, so that standard and edge of buttress might coincide as on the other side, leaving an opening between, as shown in sketch. This opening I closed *pro tem.*, but a few lengths of boarding placed horizontally from standard to standard ; and there I left it until a time of greater leisure came, in which I could carry out the notion that had occurred to me. The "happy thought" showed me in a moment, as if by a flash of mental introvision, first, how the boxes could be easily secured to the wall ; and, secondly, how the whole contrivance might be constructed so as not only to secure good and reliable means of fixing, but also how the boxes themselves might be built and finished so as to render the whole structure not only useful from the gardener's point of view, but also ornamental. This I am now going to describe and illustrate.

Boxes for wall gardening.

490. Most things must have a substructure whereon to erect or impose the superstructure ; and in showing the reader how I made my boxes for wall gardening, I must first take him into my confidence and tell him how I managed to put together the substructure on which the superstructure of decorative work of my finished boxes was placed. It is the trimming that does it in most cases- in wood work as well as in ladies' dresses, which are generally set off with that sort of thing in galore. Trimming, in fact, prevails in everything from court costume to cookery. The uniform, be it what it may, would be but a plain affair without the lace, and tripe would not be in it without its trimming of onions. Viewed in this light, my substructure of sober wood for wall gardening will be found a very plain-looking, unobtrusive aggregation of boards ; but it will assume a very different appearance, and a very different value too, when clad in the varied

garment with which I propose to clothe it. My wooden substructure which I placed about the buttress of the wall—I must call it so for want of a better

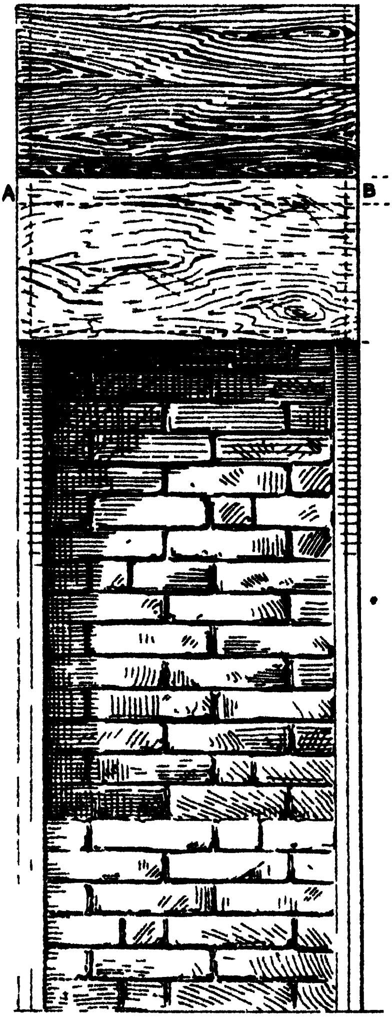


Fig. 262 Wall Gardening Boxes in Front Elevation

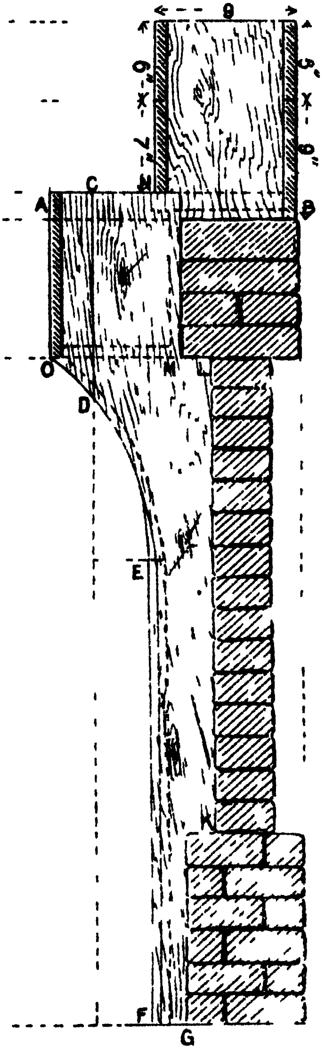


Fig. 263 Wall Gardening Boxes in Section

name is shown in front elevation in Fig. 262, and in side elevation in Fig. 263. It naturally resolves itself into two parts, the box which stood on the wall, and the box which was placed against the front of the wall. Let us deal with the box on top of the wall first of all.

Wooden substructure

491. The box on top of the wall was a box pure and simple. The top of the wall was 9 inches wide, the fence on the wall was 15 inches high, the opening between the end standards of the fence was nominally 2 feet, but in reality 2 feet 2 inches wide, the two feet corresponding exactly with the width of the buttress or thicker part of wall that separated the recessed panels, and the 2 inches an allowance for the thickness of the 1-inch boards that were to be attached to the cheeks or flanks of the projecting piece of brick work on each side of it. The box on the top of the wall was composed of front, back, sides, and bottom of timber -packing-case timber—1 inch thick. First of all, two sides were cut, 15 inches long and 9 inches wide, and two horizontal pieces of stuff, 22 inches long, one 9 inches wide, and the other 6 inches wide. These were nailed on to form the back, and 2 boards were then cut to form the front of the same length, namely, 22 inches; but one of these was 6 inches wide, and the other 7 inches wide. These were nailed on in front as shown, the narrower board above and the wider one below. When this was done, the frontage of the box was shorter than the back by 2 inches. This was done designedly, that water in the upper box might drain off into the lower box; and for another purpose, namely, the provision of a connecting link in the shape of a fillet to hold the boxes together. This fillet was introduced on each side, and its position is indicated by the space enclosed by dotted lines between A and B in Fig. 263. These fillets were securely screwed to the inside of the box on top of wall. The fillets were just 2 inches wide, and as soon as they were fixed a shorter fillet 1 inch square was nailed to the top half of the first fillet, and the bottom, a piece of board 1 foot 10 inches long, 8 inches wide, and 1 inch thick, was then dropped into place against the upper inner fillets, and screwed tightly to them. The back was then nailed to the back edge of the bottom piece The object of having a bottom was to retain the soil within the box, and prevent any escape of soil and water on the top of the brick work, which would have inevitably happened had the soil been thrown into the box on the top of the wall itself. The box was then skew-nailed between the end standard of the fencing on wall, as shown in Fig. 261, and well coated with tar inside to preserve it as much as possible from the deteriorating influence of moisture in the soil. All this, I think, is shown clearly enough at the upper part of Figs. 262, 263. The space between dotted lines from A to B in Fig. 262 indicates the opening at the lower edge of the front of box on wall to allow of the escape of water.

Box on top of wall: how made.

492. The next thing to be done was to take two pieces of board, 5 feet

Box in front of wall.

6 inches long, 9 inches wide, and 1 inch thick, and to cut them into the shape defined by the lines between the letters C, D, E, F, G, H, K, L, M, N, in Fig. 263. The point E was taken 30 inches from the upper end, after drawing the line along its centre longitudinally from top to bottom, and it was ripped down from F to E; the curved line from E to D was then traced so as to form a graceful coving, and cut through with a compass saw, releasing the entire piece D E F. A notch 2¼ inches wide at M, L, and long enough to allow the side that was being made to touch the bottom of the front of top box and butt firmly against it when fixed, was then cut in the upper right-hand corner, and a similar notch of the same width in the lower right-hand corner. The effect of this was to leave a projecting piece H, K, M, L, which fitted tightly into the recess in the brick work, and butted against the right-hand side of the projection. A similar board was cut for the other side of the brick work. Pieces of the shape shown in Fig. 263 were dowelled on, and cut at the lower corner from D in an upward direction to the point in which the line L, M, produced, cut the outer edge of the board thus attached. A stout bottom piece was then inserted between the sides from O to M, and nailed strongly and securely in place, and the front from A to O was nailed on also. The box thus formed, after a back piece had been inserted from M to N, was then fixed to the brick work by nailing the piece M, L, K, H, to wedges driven into the brick buttress; and it was further secured at top by screwing the projecting ends of the fillets as shown from A to B to the interior. Before this was done, however, an inner piece, less in width by 1 inch than the coved piece C, D, E, F, G, H, L, M. was nailed to the inner faces of the two sides. This was to form a rabbet in which trellis work was eventually nailed, in order to form a partial mask to conceal the brick work between the sides, and to afford means of training a climber on the front, which, in this case, was white jessamine, grateful alike for its foliage, bloom, and fragrance.

Trellis work in front.

193. I have said that the opening below the box in front was covered in with trellis work. This was made in the ordinary way, that is to say, of laths 1 inch in width and ⅛ inch thick; so that the piece when made might give easily to pressure and fit readily into its place. When the laths were put together, and fastened at the crossings with fine short wire nails that were clenched on the inner side, the trellis was cut accurately to size, and bradded down on the edges of the inner pieces plainly shown in Fig. 262. It was secured at top to a fillet nailed to the bottom of the box above, and at the bottom to a slip nailed across between the sides, and bedded on blocks nailed to the inner surface of the sides to receive its

ends. A finish was imparted to it by bradding on a lath over the ends from top to bottom of the inner side pieces in one continuous strip. This completed the trellis work part of the work in hand.

Rustic mosaic on sides of supports for boxes.

494. The last thing to be thought of was how to ornament in a suitable manner the exterior of the substructure; and to do this I had recourse to a pretty kind of work known as rustic mosaic, in which a pattern is formed with pieces of wood of small diameter; rods or sticks, in fact, with the bark on, cut in short lengths, and then split in half. I will endeavour to give the reader some idea of the patterns that were employed. To this end I will deal with the sides first, and finish with the fronts of the two boxes. My first care was to saw down a stick 1 inch in diameter I did not care to trust to the very poor chance of making an even split of it and nail it along the outer edge of the sides. This gave them a rough-rounded edge, which naturally added to the better appearance of the work, by taking off the stiffness which is inseparable from sharp arrises and plain surfaces, especially in garden work. This edge was in grey green, a piece of ash with the bark on, in fact. Next the edge on the flat side I worked on another piece of ash, getting a piece with a natural curve in it to saw down, and then gradually drawing it to the shape of the coving, and bradding it down as I proceeded. For this kind of work let the home carpenter remember that the oval brads are the best. As the side itself was narrow, and presented but little room for any display of pattern, I adopted the simple one shown in Fig. 264, in which semi-squares placed diagonally follow each other in regular sequence up the sides. For the sake of as much variety as possible, the light-coloured semi-squares to the left were filled in with pieces of peeled willow, and the dark coloured squares intervening, with hazel, or chestnut. Either of which will do; but whichever may be chosen, the same wood should be used throughout for the sake of regularity in the work, and uniformity of colour. The piece at the foot of the side I filled in as shown. There was, virtually, no other way of doing it without going into a sacrifice of more time and trouble than any attempt at a pattern would repay. The arrangement is simple enough, I know; but it was effective, and presented a handsome appearance, in spite of the simplicity of form and arrangement. When the rustic mosaic work was brought to a completion on all parts of the boxes that required covering in, I varnished the work with two coatings of hard white varnish.

495. As a matter of course, plants will not grow if their roots are always immersed in water. I had provided for the escape of water from the

Drainage of lower wall box.

upper box into the lower box, and I had now to do the same for the lower box. The bottom of each box was filled to about the depth of 2 inches with broken pieces of flower-pots and lumps of brick broken up till they were about the size of walnuts These with a few oyster shells made an efficient substratum for drainage. Still there was as yet no means of escape for the water from the lower box; but I managed this at last, by means of a piece of composition piping which I got from the gasfitter's. One end of this I passed through the bottom of the lower box, as close to the brick work as I could, covering the opening with a small flower-pot saucer, inverted, to keep it from being choked with soil at any time. I then cut a channel in the wall, in which I laid the pipe, and then covered it in and concealed it from view with some cement. An escape for surplus water was thus secured, without any trickling from the boxes on to the top of the wall, or down the brick work. This was done before the trellis was put on and fastened down.

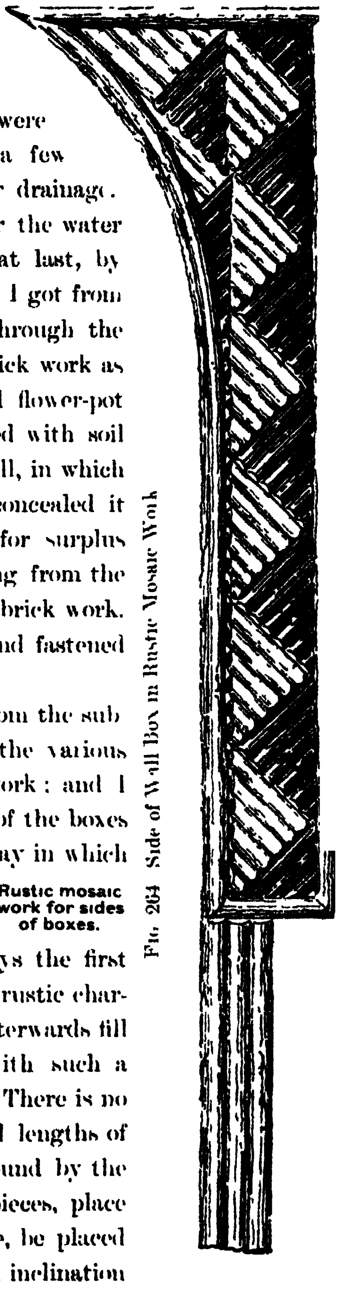


Fig. 264 Side of Wall Box in Rustic Mosaic Work

Rustic mosaic work for sides of boxes.

496. I broke away for a brief period from the subject in hand, namely, the ornamentation of the various parts of the wall boxes with rustic mosaic work; and I must now return to it. The sides and front of the boxes yet remain to be treated, or, rather, the way in which they were treated remains to be shown. Edging on any narrow surface, and framing adjacent to the edge of any surface, is always the first thing to be considered in mosaic work of a rustic character. Provide for these first of all, and afterwards fill in flat surfaces surrounded with framing with such a design as you may think best suited to it. There is no very great scope for placing pieces and small lengths of wood in this kind of work; for it will be found by the rustic mosaic worker that the semi-round pieces, place them where you will, must, as a general rule, be placed vertically, horizontally, or diagonally, with an inclination

of 45° to all vertical and horizontal pieces. With designs for patterns it is altogether different; and in these much can be done by the exercise of a little skill to produce designs of an infinite variety, each distinct from all others in arrangement and colour. I must content myself with giving two, and my readers must rest contented with the two that I am able to bring under their notice. I could multiply these to any extent; but space, time, and cost of production combine to warn me that I must hold my hand. When I had finished covering the surfaces of the bracket-like supports of the lower box, I nailed pieces of rods or sticks sawn in two, longitudinally round, and upon the edges of the wood of which the boxes were formed, and round the edges of all the surfaces to be treated, which were six in number, namely, four sides and two fronts. I used, as before, some grey-green ash, about 1 inch or a little more in diameter, for these; and I then proceeded to cover over the sides. As for the bracket pieces, I used peeled willow, and chestnut rods, which was the nearest approach to white and black that I could get without resorting to artificial means and artificial colouring, which is by no means suitable for work of this kind. A glance at the illustration will show that colour has much more to do with the appearance presented by rustic mosaic than any arrangement of the pieces of which it is composed; and this the reader will soon find out, if he will take the trouble to copy the design given, on a larger scale, and fill his drawing in with colour in different ways according to his own ideas. The treatment of the panel on sides as given above, although simple in character, is eminently suggestive of what may be done in obtaining variety in carrying out this kind of work.

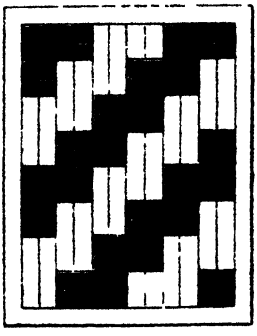


FIG. 265. Design for Rustic Mosaic Work for Sides of Boxes.

Rustic mosaic work for fronts of boxes.

197. Nothing now remained to be covered over but the fronts of the boxes; and for these I made a design of the form and character shown in Fig. 266. The outer margin of the framing was ashen green, as already said. Next came some chestnut, and then peeled willows, with which the framing of the three panels was formed. It will be noticed that the vertical bars dividing the central panel from the side panels are mitred into the horizontal pieces that form the top and bottom of the white framing. It is always desirable to do this, as it exhibits at once the distinctive character and intention of the framing, which would, in a great

measure, be lost were the vertical pieces allowed simply to butt against the horizontal pieces with squared ends only. Colour would be present, it is true, whichever way may be adopted; but without the mitring there can be no emphasis of form, and separative influence is weakened in the extreme. I have arranged the colouring of the panels in bands instead of masses, in order to get as much variety and dispersion of colour as possible. The home mosaic worker may try the effect in masses of colour if he will, making the centres of the panels white and the surrounding parts dark, or *vice versa*, but I do not think he will find the effect to be so good as that which is produced by the method I have adopted in Fig. 266. The reader, however, may satisfy this by making copies on an enlarged scale, and putting in the colouring according to fancy

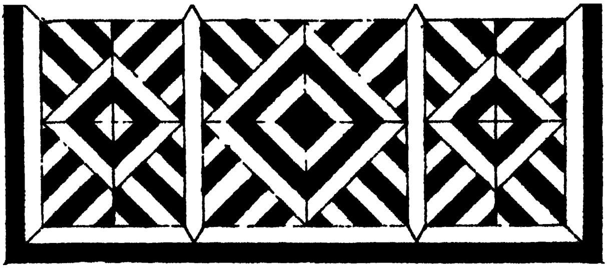


FIG. 266 Designs for Rustic Mosaic Work for Fronts of Boxes.

498. When stocked with bulbs in spring, or with scarlet and white geraniums in the summer, I found that my appliances for wall gardening looked very well, and amply repaid me for the time and labour I had expended in making them; but the unbroken horizontal line, formed by the top of the wooden fencing, and the back of the upper box did not satisfy me; and I found, that cats were disposed to take up their quarters on the boxes and bask in the sun, thereby causing injury in many cases to the plants that were growing in them. To get rid of cats altogether is next to impossible; but the approaches to appliances of this description may be made far from comfortable for visitors of this kind; and this I did by means that I cannot enter into here. But I can show the home carpenter how I managed to break the horizontal line of which I complained, and also how to make ornaments of a taking character which he may adapt to his requirements in many cases and places in which adornment of this peculiar kind may be either necessary or desirable.

Horizontal lines sometimes detrimental to appearance.

499. When looking at the dead horizontal line that vexed my eyes, and thinking how I might best break it and so destroy the monotony that it produced, I suddenly remembered that the fan played a leading part in

Fan ornament for rails and fences

Japanese social life as well as in Japanese decoration, and I sought to find how I might make a number of rays divergent from a common centre subservient to my purpose. I soon saw my way to do what I wanted, and I will now tell the reader what I did and how I did it.

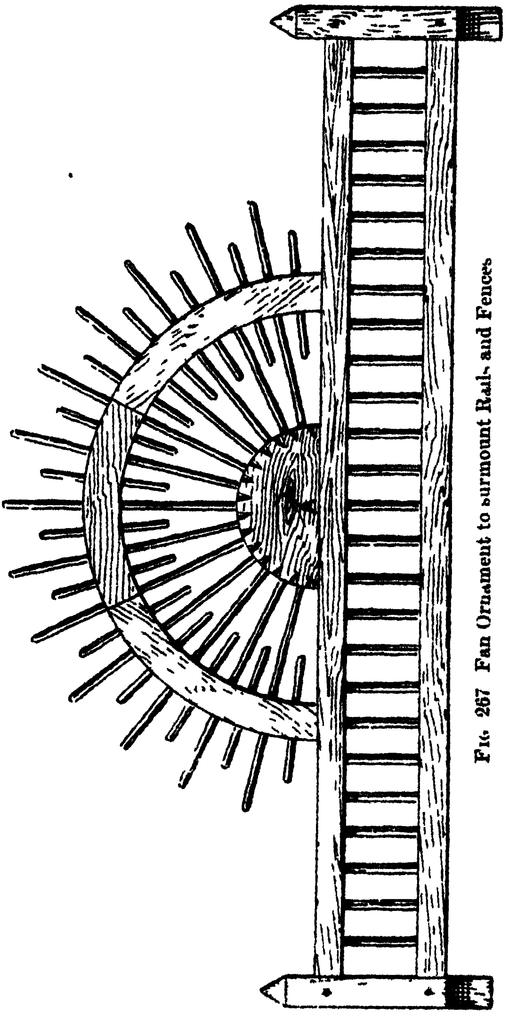


Fig. 267 Fan Ornament to surmount Rails and Fences

My first care was to make something on which I could place my semi-disc of rays, and which would form as it were a resting place for it, and a means of transition from the fencing to the fan itself, that would render the connection gradual and deprive it of the abruptness that would otherwise have marked it, had the fan emanated directly from the horizontal rail itself. I have given an illustration of this fan ornament in Fig. 267. It is correctly rendered as far as representation goes, but, unfortunately, I cannot remember the actual dimensions of the parts of the fan itself, and so I cannot give them to the reader. The lower part I know was made of quartering 2½ inches by 2 inches, and the standards at the sides were about 18 inches in height, and the rails about 6 feet 6 inches in length. The rails were tenoned into the standards on each side; but the tenons in the lower rail at its ends were only half the depth of the rail, and carried in from the upper part, so as not to interfere with the tenon at the bottom of the standards, which were necessary to connect them with the rail of the fence in which mortises were cut to receive them; and when the ornament was put in place these were driven close home and secured by screws—2-inch screws—which went fairly through the wood, and just touched the surface on the other side when slightly countersunk. In order to keep up the rustic character of the ornamentation as much as possible, and make it correspond with that of the wall boxes, I used, for rails between the rails of the framing—spindles, as they would be called in cabinet work straight sticks, cut into lengths sufficient to drop into the holes about ½ inch in depth, bored for their reception in the lower part of the upper rail, and the upper part of the lower rail. These were first put into their places between the rails, and the tenons of the rails into the mortices cut in the standards to receive them, and the whole framing was then driven tightly together, and screws put through the mortice and tenon joints to hold everything in place.

The fan: how made.

Preparation of semi-disc.

500. The making of the fan was much more difficult. The sticks used were of the same kind as those used for the railing below; they were mostly hazel rods, as straight and as clean as I could get them, and all as nearly as possible of like diameter. The semi-circular piece of wood from which the rods proceed should be 2¼ inches in thickness, that is to say, of the same width as the rail below it, and, as owing to the way of the grain of wood which runs horizontally, it would be difficult to tenon it and connect it with the rail by two mortise and tenon joints, it will be better to fix at the rail by means of stout dowels or pins ⅝ inch or ¾ inch in diameter, and about 4 inches long, so as to go right through the rail and penetrate for about 2 inches into the semi-disc A in Fig. 267, in which, as I have said, a representation of the entire structure is given. Of course, if the wood used for the semi-disc were hard wood, there would be no difficulty in making the jointing to the rail by mortise and tenon, but I am regarding the wood used as being deal, which in all probability would be the only kind of wood the house carpenter would have by him that would be available for the purpose. As thirteen of the rods employed proceed from the semi-disc, the marking gauge must be set to half its width, say 1⅛ inches, and a line marked strongly on the broad circumference. This must be divided into fourteen equal parts and transverse lines, drawn with pencil and square across the broad edge of the semi-disc, and at right angles to the gauged line by which it has been divided longitudinally. The thirteen points shown by the crossing of this line by the transverse lines are the centre to which a centre bit ⅝ inch wide must be successively applied in order to bore holes to the depth of ½ inch or thereabout, into which the thick ends of the thirteen rods

must be inserted. Bear in mind that it is better to make the holes slightly smaller than larger than the average diameter of the ends of the rods, because the rods should fit tightly into the holes, and if the ends of any are too large to enter, they can easily be reduced with a pocket knife and thus brought to fit Of course, if the maker wishes to do so, a small brad may be driven through the edge of the semi-disc, so as to enter and hold the end of the rod, but if the rods be fitted in tightly, there is no necessity to do this, as the removal of the brad would be attended with difficulty if any of the rods broke or got broken, and renewal by the insertion of a fresh rod was necessary.

501. We now come to the making of the semi-circular band; but before entering on this part of the work, it is desirable that the wood worker should make a full size diagrammatic plan of the fan, in order to enable him to cut the arcs, of which the fan is composed, of the proper shape and size. This plan should be made on a perfectly flat surface, and the best for the purpose is the top of the work bench itself, if large enough. First of all draw the base line A B, of indefinite length, and from C, a point taken as nearly as possible in the middle of it, draw C D at right angles to A B. The point C will then form the common centre from which all the semi-circles in the diagram will be described, and from which all the rays in the fan will diverge. The diagram is not drawn accurately to scale, but, for sake of example, we will suppose that we are making a fan 36 inches in diameter; that is to say, in which L R, the diameter, is 36 inches in length Then the radius, C L or C K, will be 18 inches, and we may apportion this length of 18 inches in the following manner: C E, radius of semi-disc, - 4½ inches, E X, 4½ inches, F G, 3 inches, G H, 2 inches, H K, - 3 inches,

Plan for the semi-circular band

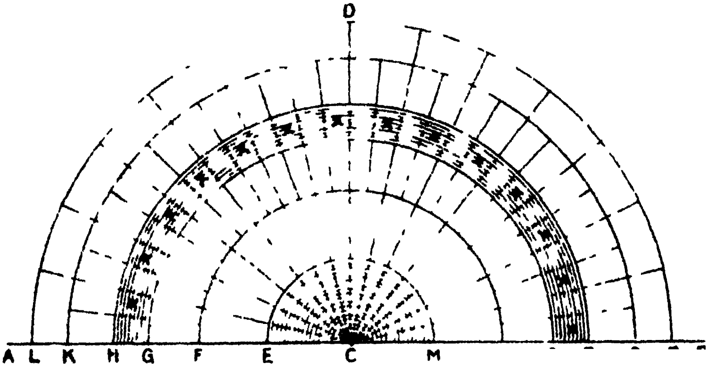


FIG. 268 Diagrammatic Plan of Fan on Bench

K L, = 2 inches. Mark these distances carefully and accurately along C L, and then with a large pair of compasses describe from C as the common centre at the distances, C E, = 4 inches, C F, = 8 inches, C G, = 11 inches, C H, = 13 inches, C K, = 16 inches, and C L, = 18 inches; the semi-circles, E M, F N, G O, H P, K Q, and L R. "Haven't got compasses large enough for a job like this," growls the home carpenter. Well, I don't suppose you have, but I will wind up this chapter by telling you how to make a pair, which, when made, you can keep by you in the certainty that they will prove useful under many similar circumstances. As the lines of which the diagram is composed must be defined as clearly and sharply as possible, they should be traced in black or white; so I will show you how to make compasses that will carry black or white crayons or charcoal and chalk. Let us suppose the arcs have been drawn in white; so in this case, before going any further, tint the solid parts of the fan, that is to say, the semi-disc and the band, by shading the corresponding parts in the diagram with black crayon or charcoal. These will be the semi circle E M, and the band comprehended between the semi-circles, G O, H P. This is done to prevent the possibility of any mistake which might arise if the space representing the band were not indicated in this manner. Now, with smaller ordinary compasses, divide the outermost semi-circle L D R into fourteen equal spaces, and from the points thus obtained, draw by the help of a straight-edge straight lines to the common centre C. These will show the position and direction of the thirteen longer sticks or rays of the fan. Then bisect each of the fourteen spaces thus obtained, and from these intermediate points draw straight lines towards the point C; but let these lines be intercepted between the semi-circles K Q, and F N, as it is by them that the position and direction of the shorter rays or sticks of the fan are shown. The diagrammatic plan of the fan is now complete.

Making the band.

502. Having thus cleared the way, the making of the band in wood may now be entered on; and let us assume that the average diameter of the sticks where they touch the band will be ½ inch, as they must of necessity diminish in diameter as they run from the lower end where they enter the semi-disc to the upper end. The band itself will be, as a matter of course, 2 inches wide, and 2¼ inches thick like the semi-disc. There are many ways of making it; but do it how we may or will, it must be made in pieces and put together, as it would be impracticable, though not impossible, to cut it out entirely in the solid: therefore, we must come at once to the conclusion that it must be made in parts or arcs which must be put together. Now, to make it in arcs of the same size that will coincide in every way, we

Preparation of template.

must have a template, and this will be best made of cardboard,—any stiff kind of brown millboard will do. To get this lay a piece of sufficient size over that part of the band intercepted between the straight lines C A and C D, and with the compasses trace out the arcs, that proceed from the points G and H as far as the line C D. Pin down the board to the bench with brads or tacks, or drawing pins, before describing the arcs, to keep it from shifting, and before taking it up again, trace on it with a straight-edge all the divergent lines that appear in the diagram below. When this has been done, remove the millboard and cut out the template along the arcs with a sharp-pointed knife. You will then have a template as shown in Fig. 269, with which all the arcs required for building the band [illegible] be drawn on the wood from which it is to be cut. The transverse lines are traced on it in case it be found necessary to terminate any of the arcs squarely, as at G H. This will be so whatever may be the line selected for the termination of the arc.

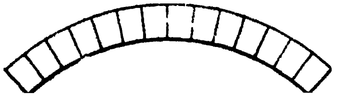


FIG. 269. Template for marking Arcs on Wood for Band.

Cutting out the wooden arcs

Attachment of band to rail.

503. The arc might be cut out in the solid like the felloes of a wheel and jointed together, and be bored with a brace and bit for the passage of the sticks; but this would hardly come within compass of the skill of the home carpenter, so we will decide at once to build the band The thickness of the wood band when complete is $2\frac{1}{2}$ inches, and as the sticks are supposed to be $\frac{1}{2}$ inch in diameter, this will necessitate cutting the arcs from board $\frac{7}{8}$ inch in thickness, because $\frac{7}{8}'' + \frac{7}{8}'' + \frac{1}{2}''$ $2\frac{1}{4}$ inches. Therefore, select some clean straight-grained board, and having planed it on both sides, mark on it some half-dozen arcs, and cut them out with a compass saw, reducing the edges where in any way uneven to the exact form required by means of a wood rasp. We must now think how we will manage the attachment of the band to the straight rail on which it stands. It may be done in two ways,— either by notching the rail on both sides to the depth of $\frac{1}{4}$ inch to receive ends of opposite arcs, reduced from within form $\frac{7}{8}$ inch in thickness to $\frac{1}{2}$ inch to fit over, and into the rail after the manner of straps, or to insert a piece between the arcs at each end of the band, to form a tenon to enter a mortise cut for its reception in the rail. The former method is the stronger, so we will decide on adopting this mode of fastening. Now, take three of the pieces, and after cutting them as nearly as possible in equal lengths, leaving sufficient in each end arc for the straps; lay them on the band shown in the plan on the bench, and brad them lightly

to the bench with thin brads to prevent any chance of shifting. See that the ends of arcs are accurately and closely fitted together before doing this. Next, lay the semi-disc and the sticks proceeding from it in place on the plan; secure the semi-disc from shifting by putting a couple of thin screws into it, and fastening it down to the bench. Then bring each of the long sticks in turn into place on the band, working them into position by aid of the lines on the diagram, and putting a light brad through each into the arc immediately under it to keep it in place. Next, cut the short sticks shown in the fan to the proper length, namely 8 inches, and lay them in place on the arcs, securing them in position by a thin brad driven through each into the arc below. Having done this take some ½-inch stuff, and cut a sufficient number of pieces, 2 inches long, and of slightly wedge-like form, to fill up the twenty-eight spaces between the sticks from one end of the band to the other Before putting them in place paint the interstices with thick paint, and fill in on each side of each stick with white lead and putty, so as to prevent leaving any opening as far as it is possible to do so; and now put in the wedge-like pieces, securing each with a brad and filling in at the top with putty and white lead between sticks and wedges, so as to produce an even surface throughout, as far as possible, on which to impose the uppermost arcs. Lay on the central one first of all, using one of the same length as the template, and therefore equal to half the band, and let the central line coincide with the line C D. Secure this in place by light thin screws 2 inches long, so as to go through the upper arc itself, and through the block below deeply into the arc below. Put the screws into and through every alternate space, as shown by the tiny crosses on the band space in Fig. 268. A long arc has been used here, so that the terminations and jointings of the upper and lower arcs may not be coincident. This is equivalent to "breaking bond" in bricklaying. Proceed thus with the end pieces, and when all the screws have been inserted on one side, lift the whole structure up, and after turning it over, put screws through alternate spaces in the same way on the side now uppermost, in every space not occupied by a screw from the other side, thus firmly locking the whole together. All that now remains to be done is to get straps, and dowels of ends and central semi-disc into place, and screw the straps at the ends of the band securely to the ends at both sides. Stain semi-disc, band and rails, and standards of dwarf railing below, to match the colour of the sticks as nearly as possible, and finish by varnishing the entire structure, sticks and all.

504. And now with regard to the promised description of all that must

be done to make a good and efficient pair of wooden compasses. First, take two pieces of hard wood, preferably of beech, or mahogany, 16 inches long, 1½ inches wide, and ¾ inch thick; plane them up nicely, and then cut them into the shape shown in Fig. 270 at A and B, removing the shaded part in each, by cutting them longitudinally up the centre of the width, to 3½ inches from the top; and then, bevelling each, from the central line to the outer edge, so that the outer edge of the projecting piece in each is 3 inches long. The side elevation of each piece is shown at A and B. At C and D are shown the elevations of A and B, as regards thickness. Now set the marking gauge to ¼ inch, and mark the top of each piece all round, so as to leave a distinct line ¼ inch from each side. Saw down as far as 3 inches in each piece with a fine dovetail saw; and then, by the aid of a ⅜-inch chisel clear away the central piece marked in black in C, and also remove the faces or cheeks, shown in black in D, so as to leave a tongue ¼ inch in width in the centre. Be accurate in cutting away to the bevel of ½ inch in depth shown in each piece, and cut the tongue in D full, so that it may fit closely into the groove made for its reception in C. This is shown on a larger scale and more clearly in Fig. 271, in which A shows the groove in C, and B the tongue in D. The parts when brought together are shown at E in Fig. 270, and also at E in Fig. 271, in which F is the tongue inserted in the groove indicated by F, also between the faces or cheeks, G and H. If this has been done truly and accurately, the inner surfaces of the legs shown in white in A and B should fit closely and accurately together throughout their length.

Wood for compasses.

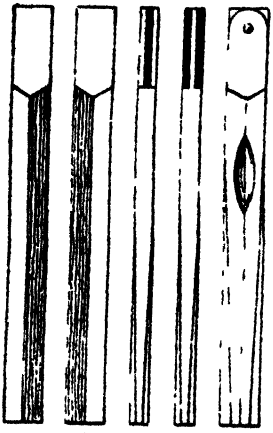


FIG. 270. Parts of Wooden Compasses.

Fitting legs of compasses together

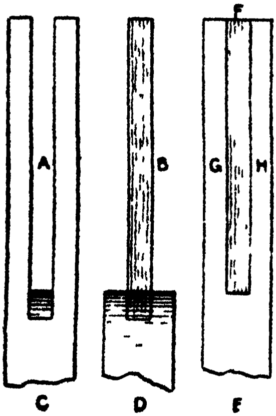


FIG. 271. Mode of Cutting Parts of Head of Compasses on larger scale.

505. We must now consider how the legs of the compasses may best be fastened together, and how they must be finished both at top and bottom, to render them efficient in every respect to do the work that is usually done by their instrumentality. When the legs have been fitted together as described

above, tie them together with a piece of string, to prevent any chance of their getting thrown out of place, and then deal with them as shown in Fig. 272.

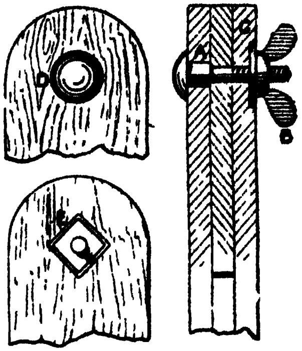


Fig. 272. Mode of Completing Head of Compasses.

Fastening of legs of compasses at top.

Buy first of all a small brass bolt, having the part on which the screw thread is cut just about 1 inch in length and ⅛ inch in diameter. The head will be like a mushroom in form, and if as much as ½ inch in diameter so much the better for the purpose for which it is required. If it has the head of the shank immediately adjacent to the mushroom-shaped top, squared as shown at A in that part of Fig. 272 which exhibits a sectional view of the bolt when passed through the legs, so much the better; as when this squared part is let into the wood below it will hold the bolt in position, and will prevent any chance of its turning round if the hole through the head gets slightly worn through use, or slackened in holding power through shrinkage of the wood. This squared part is easily fitted into place by aid of a ⅛-inch chisel, which must be used with care to ensure a good fit. Instead of an ordinary square nut, let the nut that works on the screw thread be a butterfly nut, or winged nut, as it is sometimes called, as shown at B. Let a small washer or square plate into the wood, as shown in section at C, and in plan at E, and let the outer surface be flush with the wood. The butterfly nut will work against this when screwed up tight, and it will save much wear and tear through frequent use. The chief object in having a nut of this kind is to tighten up the head when the points of the compasses are set to any particular distance which it is desired to preserve; as, although it is possible to do so, it is by no means an easy and practicable job to fit the compasses, as is usually done in the case of iron compasses with an arc equal to the fourth part of the circumference of a circle, one end of which is fixed in the leg, to the left, which is generally spoken of and regarded as the immovable leg, while the other works through a slot cut in the movable leg. This quadrantal arc is usually graduated so that the legs may be opened to any angle within and up to the limit of the arc; and the legs when brought

Quadrantal arc.

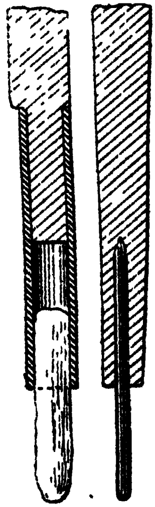


Fig. 273. Mode of completing Bottom of Legs.

as far apart as required are held in position by a small screw with a milled or winged head as the case may be, which works in a female screw cut in the movable leg and acts on the arc by pressure of its point. The head of the bolt is shown in plan at D, and the head is finished by rounding off the corners of the top, as shown in D and E in Fig. 272, and also in E in Fig. 270.

506. Let the reader look now for a moment at E in Fig. 270, and he will see two elongated notches, curved in shape, cut on the inner edges of the legs of the compasses. These notches should be made on each side, and should be about 3 inches long, ½ inch wide, and ¼ inch deep. They are made to enable the home carpenter to pull the legs of the compasses apart with as little difficulty as possible; for they should be fitted as tightly together as possible at the top, and work as stiffly as is consistent with security from splitting. If at any time they seem to work too stiffly, apply a little grease to the tongue on each side of it. Then shape the legs, as shown at C, D, and E in Fig. 270, reducing them gradually from just below the notch until they are about ⅜ inch square at the lower end. There must be no reduction made on the inner sides of the legs, but these must be left untouched, that they may fit close together from top to bottom. Lastly, finish off the legs of the compasses at bottom, as shown in Fig. 273, fixing a wire nail, brought to a blunt point in one, and attaching a brass ferrule, or tube, to the end of the other, recessing the leg so as to fit it on as shown. It does not matter whether this be round or square, as crayons are usually square in form; but a round fitting will be easier to get than a square one. Into this ferrule, which should be about ⅜ inch external measurement, crayons, black or white, or pieces of chalk or charcoal, may be fitted with the utmost ease. With such a pair of compasses as I have just described—I almost fear, too minutely and at too great length—the amateur wood worker will be able to strike out any circular work that he may be called upon to execute; and he may rest assured that he will never regret the time that he has spent in making them

Shaping legs of compasses.

Finishing legs at bottom

CHAPTER VI.

SUPERFICIAL ORNAMENT IN WOOD WORK: ITS GENERAL EFFECT AND EASY ATTAINMENT.

Desirability of Ornament in Wood Work--Ornamentation: How Effected--Charm of Diversity of Surface--A Problem in Wood Working—Ornamentation by Notching—Marking out Surfaces for Notching—Dimensions of Notches--Mode of Cutting out Notches--Addition of Notched Work to Front—Diversifications of Notching—Divergences from Original Type—First Divergence—Substitution of Triangular Bar for Rectangular Slip Divergence in Position of Triangular Bar—Use of Triangular Bar and Mopstick in Ornamentation—Ornamentation of Porch to Greenhouse—Its Suitability for Garden Arches, Gateways, etc —Construction of Porch to Greenhouse—Component Parts of Porch—Rails at Side—Rebate for Trellis Template for circular Part of Rebate—Trellis for Porch and its Attachment—Seat of Porch—Door of Greenhouse—The Corona outside the Porch—Imitation of Stone Work in Wood Work—Details of Small Greenhouse—How a Bit of brick Wall was masked—Dimensions of Blocks Attachment of Blocks to Boards—Alternative Style of Treatment—Lascelles' Fish Scale Tile Slab—Imitation of Fish-Scale Slab in Wood--Construction of Slab Imitation of Slab in Wood Work—Weather Boarding Mode of Attachment—Boards for Imitation of Fish-Scale Slabs Preparation for Attachment—Ornamental Work in Imitation of Fish-Scale Slab—Marking Out Describing Arcs—Divisions between Tiles in Fish-Scale Slab--How to Make concrete Slabs—Imitation of Tiles in Wood Work—Regular Polygons for Tile Work—Dentils and Blocks for Fillets—Japanese Headings for Panels

507. It is somewhat surprising to note how seldom wood workers think of superficial ornamentation in wood work as a means of breaking up the monotony that too often mars the general character and appearance of wooden structures, and renders them flat and unattractive, and on this account unsatisfactory, although a comparatively slight amount of thought and labour expended in this direction would, and does, when it has been effected, draw forth an involuntary exclamation of "How pretty! where did you get that?" or, "How in the world did you manage to make that?" from those who see it. I have often managed myself to change the character of even a single and simple member of a structure into that of a piece of work that had taken much time to manipulate, so as to produce the appearance of elaborate carving that it represented, that I am tempted to devote a very brief chapter to the consideration of a few of these points, preferring to treat them *en masse* in this way, to touching on them singly and separately in connection with the structures of which they formed a part, especially when I remember that some of

Desirability of ornament in wood work.

the contrivances in which they were introduced were not altogether such as are worth describing at length in the present volume.

508. The ornamentation of surfaces is very easily managed and carried out by mocking—a species of work that I have already fully explained, and by the use of the chisel, after the manner of a graving tool as well as a paring tool. That of edges is also effected by the free use of the chisel. I will proceed at once to give a few cases in illustration of what I have now advanced, leaving it to my readers to apply the principle in such cases in which they may think it desirable. I will show first of all how some truly surprising effects may be produced in a very short time by the instrumentality of a few notches, and then proceed to give examples of the attainment of some excellent effects in surface work, by mocking and chiselled work as easily and almost as quickly carried out. If I am asked what principle lies at the bottom of these effects, even as truth is said to lie at the bottom of a well, I will say at once that it is the breaking up and diversification of surfaces, otherwise tame and monotonous, as I have said, through their continuousness, by the introduction of light and shadow, which instantly imparts that change and relief which the human eye so much desires and requires. It is infinitely more pleasant and less fatiguing to walk along a winding road than along one that is straight—a lane, in fact, that has no turning, and the end of which may be perceptible to the eye long before it is reached by the plodding feet of the wearied walker—wearied wholly and solely by the want of change. Hill and dale are far more attractive to the traveller than the unbroken expanse of a level plain. A fretted picture frame is infinitely to be preferred to one that is utterly smooth and flat. Oratory, even of the most brilliant character, delivered without inflection of tone, is ineffectual to strike the ear and move the hearts of those who are listening to it. It is the trimming that in ninety-nine cases out of a hundred makes the dress an object of admiration. A single article of diet constantly repeated soon palls on the jaded appetite; and the sweet odour of the most exquisite of perfumes would soon lose its effect if applied for long continuance to the tired nostrils. And even the sense of touch too long maintained gets deadened, and at last fails utterly to impart the pleasing power that it possessed when hand first met hand in tightening clasp. And from what cause in every instance? Simply the want of change and relief that every sense demands to render it perceptive.

Ornamentation: how effected.

Charm of diversity of surface.

509. But to proceed at once to the effect produced by simple notching. I was once engaged in putting up a shelf that formed a bracket for the re-

ception of some flower pots at the top of a buttress in the corner of my garden; when I became dissatisfied with the plain and tame appearance of the whole affair; and I felt inclined to take axe or hammer and knock the whole bit of work to pieces again. I held my hand, however, and left the work for a time, as I generally do if anything occurs to prevent me from seeing my way promptly and clearly to the desired end; and before I took it up again the mode of ornamentation that I am about to describe came into my mind. How, I have not the slightest idea; it is a difficult matter to trace thoughts and ideas to their genesis in most cases; and no one yet has managed to show how, to use a common expression, they come into one's head. But be this how it may, I was led to think of the process of ornamentation by notching, and I lost no time in adopting it and working it out. The problem I had set myself to solve took the form of words something in this way—*Given, a flat surface 17 inches long and 2 inches wide: how best to break the monotonous continuity of its arrises and frontal flatness*—How I arrived at the required Q. E. D., the reader will gather from the following sections.

A problem in wood working.

510. The first mode of ornamentation followed by uncivilised or savage races was by notching the edges and surfaces of their rude weapons, tools and implements. It was effected by incision, or cutting into the materials of which they were made; and they were in point of fact the first to originate and practise an art, or rather branch of art, namely, a branch of wood carving known in the present day as "chip-carving". In Fig. 274 the beginning of the ornamentation is shown in the treatment of part of the edge of a square wooden rod. If it were fully carried out along two adjacent edges, one side of the rod would be broken up into lozenges, and the edges into a number of small triangular facets, or surfaces arranged in pairs, inclined to one another from apex to base. It is, in fact, an adaptation of the so-called tally system, by which our remote ancestors kept their rude reckonings. They did it, however, irregularly and without system; whereas to be satisfactory to the eye it is needful that the notching should be done.

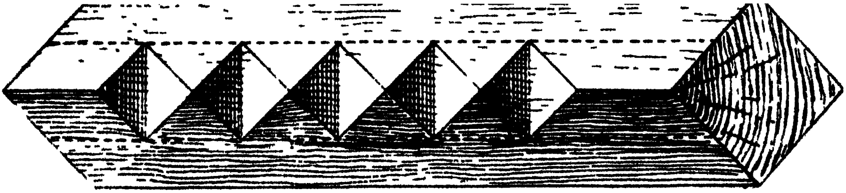


FIG. 274. Diversification of Edges on Arrises in Wood by Notching.

Ornamentation by notching.

not at haphazard, but in a way that is at once both regular and systematic; so before a notch is cut, the surface of the wood, or rather two adjacent and contiguous surfaces of the wood, must be measured out into equal intervals or spaces by the aid of marking gauge, rule, square, and pencil, so as to obtain guide lines to assist both eye and hand in the direction of the incisive tool by which the work is to be effected. Let A and B, then, in Fig. 275, represent two adjacent and contiguous surfaces meeting in one of the edges of a square rod of wood such as the above, or of the front and upper edges of any piece of wood such as I mentioned in the last section but one. I have left a space between the surfaces in the diagram given in Fig. 275 for the sake of distinctness, showing their correspondence by dotted lines. Suppose them to be fitted together, the part A would be on the upper edge of the wood, and the part B on the front. Suppose that we wish to make the notches 1 inch in length from point to point along the edge of the wood and ½ inch deep into the surfaces. Set the marking gauge to ½ inch, and mark the lines, C D, and E F, shown as dotted lines along the upper side and the front respectively. Then mark out the edge by rule and pencil into ½-inch spaces, as shown at G, H, K, L, M, etc., and through the points thus obtained draw by means of the square straight lines along both surfaces at right angles to the edge itself. Lastly, from the alternate points G, K, M, etc., draw to the intermediate points N, O, etc., on the upper edge and P, Q, etc., on the front, the diagonal lines, G N, N K, K O, O M, on the former, and G P, P K, K Q, Q M, etc., on the latter. These diagonal lines accurately define the shape and extent of the pieces of the wood that are to be cut away in order to form the continuous series of notches along the edge.

Marking out surfaces for notching.

Dimensions of notches.

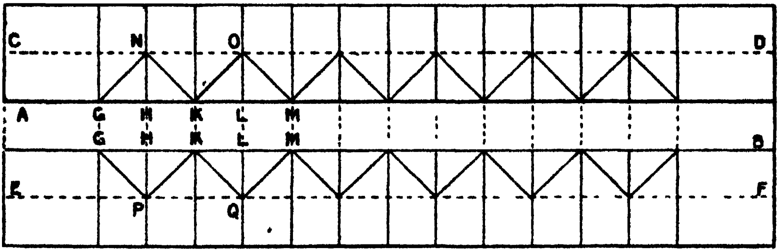


FIG. 275. Marking of two adjacent Surfaces of Wood for regular Notching of Arris in which they meet

511. The incisions necessary for the removal of the wood should be made with a sharp and broad paring chisel. It will facilitate their removal if saw cuts are first made with a dovetail saw, through the points H, L, etc., to the points N, O, on the one surface, and the points P, Q, etc., on the other. The

saw cut should be carried barely to the points, and made with great care so that it may in no case sever the grains of the wood beyond, or on the other side of the dotted line. The parts to be cut away should then be taken out by degrees, first a piece in the centre of the notch at H L, etc., and then the pieces left between the part thus removed and the sides of the notch. In making the final cuts, the edge of the chisel should be carried firmly, but with care and precision, along the diagonal lines G N, K N, and G P, and K P, and carried along the corresponding pairs of diagonals simultaneously. This method should be pursued, at all events, until hand and eye are sufficiently trained, and enough practice has been had to enable the operator to dispense with the saw-cut, and form the notches quickly and surely with four cuts of the chisel rapidly delivered. The wood worker will be astonished to find how quickly the notches can be made, as he acquires facility in the use of the chisel and confidence in doing the work.

Mode of cutting out notches.

512. The first time I tried my hand at this kind of work I did not make the notches on the wood that formed the front of the shelf, but on a separate piece 30 inches long, 2 inches wide, and ½ inch thick, which I afterwards bradded on to the original front; but even now the appearance of the front, improved as it was, did not please me, so I took another slip of the same length and thickness, and 1 inch wide, and treated the top and bottom edge in the same way, so that a series of lozenges or diamonds was presented all the way along the front. With this I was satisfied; for the diversification of surface thus obtained had such an elaborate appearance that it entirely relieved the plainness that otherwise characterised the whole affair, and prevented the eye of the beholder recognising this by attracting it at once to the ornamentation which was thus brought into prominence. I have since used it with good effect in different positions and different purposes. If the wood worker has any difficulty in comprehending my description and the diagram given in Fig. 275, let him enlarge the two parts of the diagram to double the size on two separate pieces of paper, and then paste them on a piece of wood, bringing the lines on each piece to meet along the edge of the wood, and then cut the notches. This he will find to be a desirable and easy mode of making his first essay in marking out the work and cutting the notches.

Addition of notched work to front.

513. I now come on to some diversifications of form in the notched work I have been describing which are well worth the reader's attention. The first kind that I made, and which I have been endeavouring to describe, is shown geometrically in Fig. 277, and in relief with light and shadow effect in Fig.

Diversifications of notching.

276. Fig. 277, strictly speaking, is a front elevation of the composite bar, as I may call it, presenting a flat surface, 2 inches in width, with a slip 1 inch wide and ½ inch thick running along its centre. Sometimes I have made my bars in the same way, 3 inches wide with a 1-inch square bar running along the centre of the 3-inch face behind it. Of course, there are four parts in Fig. 277 that have to be marked for notching, but which are not shown in the front elevation These parts are the top and bottom of the main or broad part of the rail, and the top and bottom of the slip in the middle These, in actual fact, are given in and may be taken from Fig. 275, in which A shows the marking of the *top* of each piece, and B the *bottom* of each piece. In Fig 278 sectional views are given of sections of the bar as they would appear if the bar were cut asunder transversely at A and B respectively, and in any line intermediate between sections occurring as at A and B. Thus C in Fig. 278 represents the section that would be cut transversely or vertically just halfway between B and the next point, which, as far as section is concerned, would be a section similar to that at A, the section at the next ½-inch point in succession being the same as that at B, and so on. Thus the bar, as shown in light and shadow view, as geometrically rendered in front elevation, and in sectional diagrams in Figs. 276, 277, and 278, may be regarded and spoken of as the original type of the notched system of ornamentation effected by simple incision.

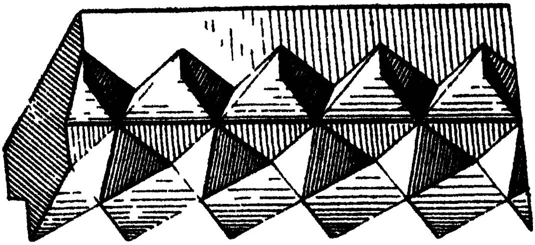


Fig. 276. Light and Shadow View of Notched Work in Fig 277

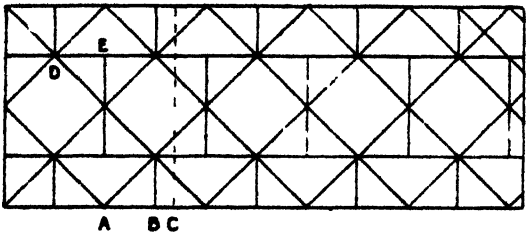


Fig 277 Notched Work in Fig 276 Geometrically Rendered

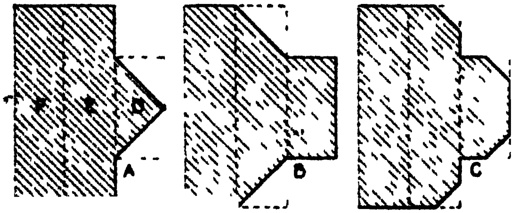


Fig 278 Sectional Diagrams at A B and C in Fig 277

514. The first divergence from the original type is shown in Fig. 279, which also represents in front elevation the form of composite bar or rail delineated geometrically, and otherwise in the earlier figures from Figs. 275 to 278 inclusive. The difference in the bar itself is but a trifling one; but before beginning to explain the point in which the difference exists, I may as well point out that the dotted lines in the sections at A, B, and C, show how the bar may be built up of three pieces, the 1-inch slip being held to the second slip by screws about $\frac{5}{8}$ inch long, inserted from the back of the intermediate piece E, in section A in Fig. 278. In putting in the screws the heads should be well driven into conical holes made with a small rose bit or countersink held in a pad; and care must be taken so to adjust things that the screw may enter directly in the centre of the lozenge shown above at B, in Fig. 277, so as to avoid any chance of bringing the edge of the chisel in contact with the screw, as it might be if the screw were put in carelessly and in the wrong place. It is on this account that I have advised the use of $\frac{5}{8}$-screws, and of these No. 7 will be thick enough. And now we come to the first divergence from the original type, which is shown in front elevation in Fig. 279. This, although it may and certainly does look a matter showing considerable difference of construction from the diagram itself, is in reality a very simple matter altogether, and consists merely in sliding the 1-inch slip just $\frac{1}{2}$ inch to the right or left along the broader slip behind. Supposing it to be pushed just $\frac{1}{2}$ inch to the right, the effect would be to bring the point marked D in Fig. 277 just to the centre of the base line of the triangular flat space 2 in the same figure, and so on for every similar point in succession from one end of the diagram to the other. This any one may readily see for himself, if he will take the trouble to copy the central part of Fig. 277, precisely the same size as the original diagram, and then lay it on Fig. 277, and pass it slowly along until the point D comes exactly under E. He will find that it then assumes the appearance shown in Fig. 279. The effect of this is to bring the lozenge D immediately under the flat triangular space at E; thus producing a complicated appearance in the notching, which would appear to be something considerable to the superficial observer. In this case the section through D vertically made

Divergences from original type.

First divergence.

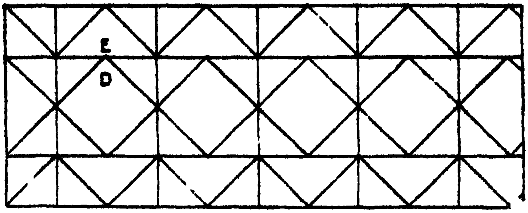


FIG. 279. Alternative Disposition of Notched Work in Fig. 277.

in Fig. 279 would assume the form shown at B in Fig. 278 with the corners on. The corners in the three sections A, B, C, are shown by dotted lines, to indicate the parts that are removed by the notching.

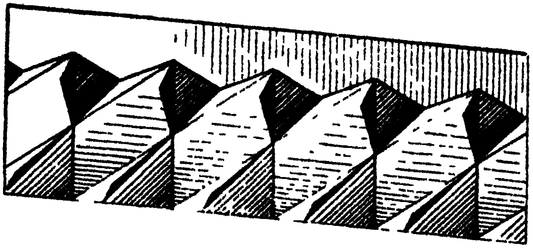


FIG. 280 Light and Shadow View of Notched Work in Fig 281

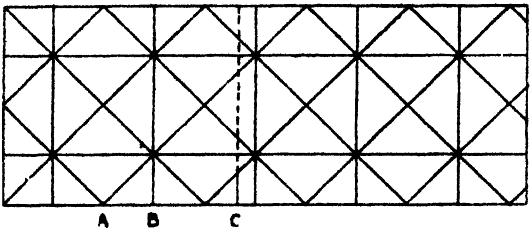


FIG. 281 Notched Work in Fig 280 Geometrically Rendered

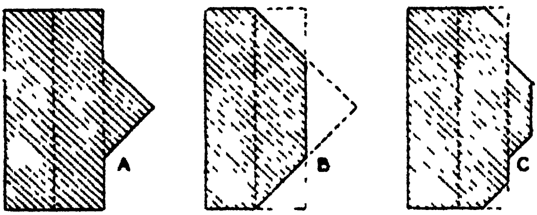


FIG. 282 Sectional Diagrams at A, B and C in Fig 281

515. We have been considering a divergence in position from the original type; we will now look at a divergence in form in which a triangular slip, formed by dividing diagonally a square rod, whose diagonals from corner to corner are exactly 1 inch. This is used in substitution for the flat rectangular slip 1 inch wide and ½ inch thick, used in bars of the first type. In making this it is desirable that the triangular slip should be glued to the face of the broader slip with cold waterproof glue, and well damped down and left under clamps to dry and unite completely before it is cut, because the effect of the cutting will be to produce a succession of square pyramidal prominences with four triangular sides all the way along the front of the bar. The light and shade effect of this description of notching is shown in Fig. 280, the front elevation of the notched work geometrically rendered is shown in Fig. 281, and sectional diagrams of the bar, if divided transversely and vertically at A, B, and C in Fig. 281 in the sections, similarly lettered in Fig, 282. I need not enlarge on these diagrams, but will content myself with saying that in order to see how marked is the difference that exists between them, the home carpenter should make himself a set of bars done in each way, and keep them as specimens in his workshop.

Substitution of triangular bar for rectangular slip.

516. Similarly the diagram or front elevation shown in Fig. 283 is just a divergence of position formed by moving the disposition shown in Fig. 281 just ½ inch to the right or left, as was done in the case of Figs. 277 and 279. The change of position has the effect of bringing the uppermost triangular surface of the pyramidal form above A in Fig. 281 immediately under the point of the uppermost notch on the line B with precisely the same effect, and there is a similar alteration of appearance. The reader must now be left to find out other forms for himself, which he will doubtless succeed in doing. I could suggest many, but I am compelled to hold my hand and to proceed to something else.

Divergence in position of triangular bar.

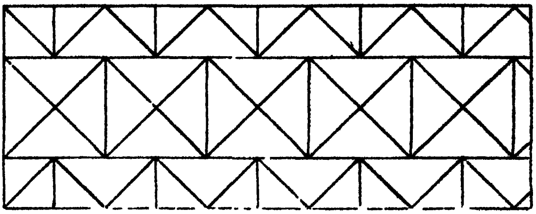


FIG. 283 Alternative Disposition of Notched Work in Fig. 281.

517. I have just been speaking of the use of the triangular bar as a means of ornamentation in wood work, and I may say I have used this and the mopstick moulding with excellent effect in garden carpentry. I once made a very pretty front to a trellised porch in front of a five-sided glazed house in one corner of my garden, ornamented with mopstick work. A friend of mine the catechiser in the Tramp's Catechism - was unkind enough to say that it looked like a Salvation Army bonnet when it was finished; but I will give my readers the front elevation of it presently, and leave them to judge of the general effect. I only know that the fragrance exhaled from the flowers of the honeysuckle with which the trellis was covered was delicious in the summer evenings; and the little greenhouse which was made by putting a three-sided front before a corner formed by the meeting of two walls of the garden, and carrying it up till it terminated in a box-like structure against which the rafters or principal bars of the glazed roof were butted, and which was surmounted by the end of one of the posts of a four-post bed, with a wire proceeding from the top which carried cross bars, terminating in the letters N, S, E, W, with an arrow above as a vane to show which way the wind blew, answered the purpose of masking the back view admirably I shall have more to say about this greenhouse in the proper place presently, but I will deal with the porch now in connection with the style of ornamentation that it exhibited.

Use of triangular bar and mopstick in ornamentation.

518. Accordingly, I have shown the front elevation of this porch in Fig.

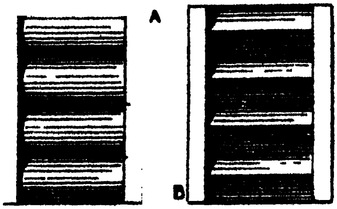


FIG 284. Ornamentation of Garden House Porch in Mopstick Moulding (A), and Triangular Barwork (B)

Ornamentation of porch to greenhouse.

Its suitability for garden arches, ways, etc

285 in a sketch view, which exhibits the greenhouse door as well; but I will show the style of ornamentation here in Fig. 284, both in mopstick work and triangular work on a larger and bolder scale. It was made in a very simple manner. The porch had a circular top, which was made in much the same manner as the band of the fan previously described—with this difference, that it was solid and not pierced. It was 6 feet high and 2 feet wide, inside measurement, from side to side, and the bases of the sides were pieces of quartering, 2¼ inches by 2 inches, disposed so that the narrower side formed the face. On each side of these posts or standards thin slips of wood were nailed, which projected about ⅝ inch or thereabouts beyond the face of the uprights, and between these pieces of mopstick 2½ inches long and 1 inch wide at base were nailed transversely, as shown at A. The effect of triangular bars, as shown at B, is equally good; and so would a mixture of the two, in which a piece of mopstick and bit of triangular bar would be used in alternation. I have some satisfaction in having safely dealt with this kind of ornamental work here, because there are many structures in which home carpenters will find it of the greatest use, and notably in that of garden arches, ornamental gateways, etc. I need now only refer to it, and it may often save the tediousness of an over long description by giving the ornamentation here, and then referring to it. I may close the matter as far as style and construction is concerned by saying that in garden work sticks split down the centre or sawn down may be used instead of mopstick work or triangular bars; and instead of putting it on transversely and horizontally, it may be arranged diagonally in the style of the rustic mosaic work in Fig. 264; or, to save trouble, if time presses, it may be put on vertically, though the effect is far from being so good. An arrangement in which a few pieces are put on transversely and then a few vertically for the same length has a very pleasing effect.

519. In Fig. 285 is given, as I have said, a sketch view of the porch of which I have been speaking; and this also comprises a representation of the greenhouse door. The construction of the porch will now be better understood. The porch itself was 6 feet high and 2 feet wide, *inside* measurement. I should have liked 6 inches more headway, and a little more width; but

when I went in and went out I was obliged to stoop a little, as a goose is supposed to do when it passes under any archway or lintel. Personally, however, I have watched geese now and again to see if they would carry out and substantiate the popular supposition, but I have never yet come across any goose that was goose enough to do it. According to the disposition of the quartering, as mentioned in the previous section, the porch, including the framing, was 6 feet 2 inches high and 2 feet 4 inches wide, *outside* measurement. The framing of the door corresponded in dimensions to the framing of the porch. To save any doubt on the part of my readers, I give a plan of the porch in Fig. 286, which will make everything clear and comprehensible. It is on the scale of 1½ inches to 1 foot, or ⅛ inch to 1 inch, and so is the diagram of the corona at the top of the porch in Fig. 287.

Construction of porch to greenhouse.

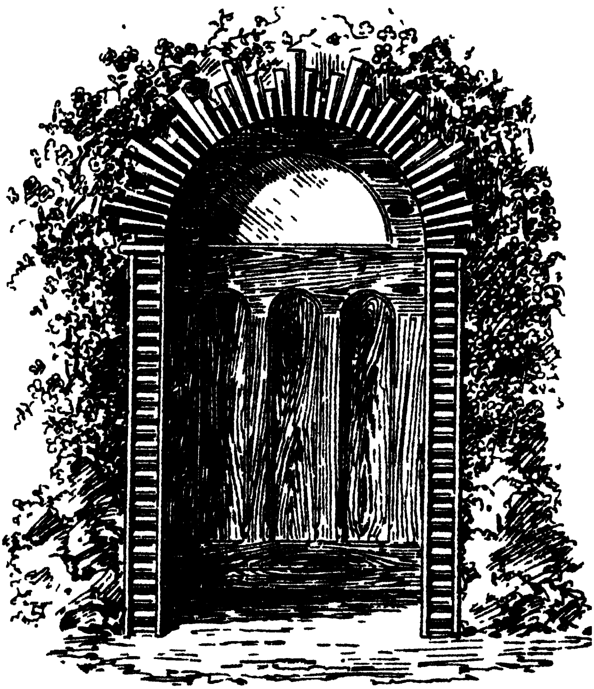


FIG 285 Sketch View of Porch to Greenhouse and Greenhouse Door

520. The front of the porch was made separately, as I have said, and consisted of two uprights and the semicircular arch that was built together at the top. When this was done, I connected it with the framework of the greenhouse by means of cross rails. The uprights were cut long enough to enter the earth for about 18 inches, or perhaps more; and before the ends were put in the ground they were well dressed with tar. The rails were halved into the framework of the greenhouse and the external framing of the porch, and the notches in the framings were carefully regulated by measurement to correspond. I do not give a side elevation, because this

Component parts of porch.

is scarcely necessary; for the reader, I think, will understand what was done from the measurement, given in the description now to follow of the mode **Rails at side** and means employed. From *external* face of porch to *internal* face of greenhouse, including uprights, was 22 inches; and therefore I cut six rails, 22 inches long, 2 inches wide, and 1 inch thick three for each side. As the height of the top of the arch *internally* was 6 feet, and the width of the porch, also taken internally, was 2 feet, it will follow that the spring of the semicircular arch commenced at the height of 4 feet or 48 inches—it will be better to measure by inches—above or from the ground level, and the distribution of this distance was first of all in three parts: namely, 2 inches for notch for top rail, and the same for bottom rail, leaving 44 inches between the rails. Now, I wanted to make provision for a removable seat across the porch, the surface of the seat to be chair height, above the ground, that is to say, 17 inches; and as the seat was to be made of wood 1 inch thick, the top surface of the rail on which the sides would rest would be 16 inches above the ground level. Thus, reckoning downwards from the upper surface of the top rail, I got my length of 48 inches thus divided -2 inches, width of top rail + 30 inches between top and middle rails + 2 inches, middle rail + 12 inches between middle and bottom rails, + 2 inches, width of bottom rail.

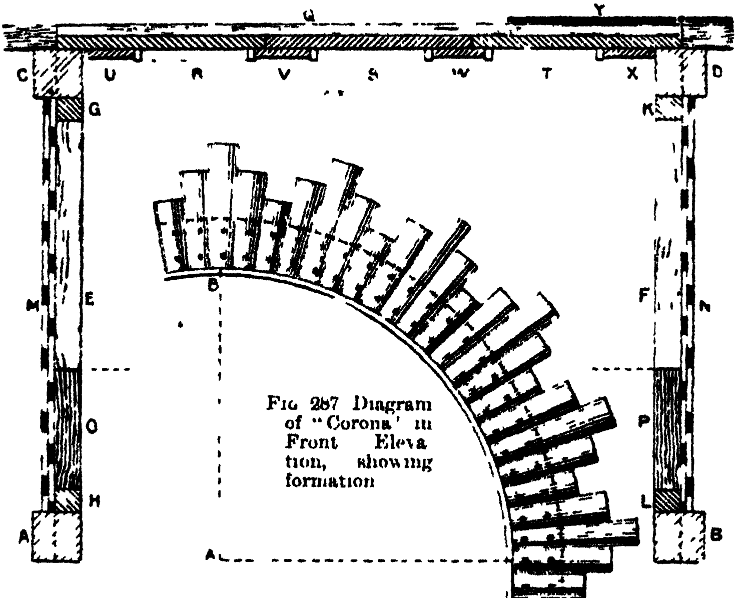


FIG. 287 Diagram of "Corona" in Front Elevation, showing formation

FIG. 286 Plan of Porch

Accordingly, notches were made in the inner faces of both inner and outer faces at these distances. As the rails were 22 inches long, and the uprights virtually 2 inches square, 2 inches at the ends of each rail had to enter the uprights; and the space between the inside faces of the framings to be connected by the rails was consequently 18 inches. It is really immaterial to which piece of framing you first attach the rails; but I judged it better to screw the outer ends to the outer movable or free piece of framing first of all, and I did so accordingly, trying each rail with the square, both before and after I had fixed them. I should say that I nailed two slips across the outer face of the outer framing to preserve the parallelism of the uprights, until these were fixed in the ground, and the holes in which the framing was put was filled up with stones, broken bits of brick, and loose soil, and the whole rammed tight. When the outer framing was put in place, I screwed the ends of the two top rails in their proper notches, testing them with the level. I then did the same with the other rails, and when I had got everything properly into place and screwed down, I filled up the holes, testing from time to time with the level, lest the downward action of the rammer should tend to draw the rails out of the level by the strain put on them by the blows directed at and on the filling. But all went on without any mishap, and this part of the work was soon brought to a completion. In Fig. 286, which gives the plan of the porch, the uprights of the external framing are indicated by A and B; the corresponding uprights of the framing of the greenhouse by C and D, and the bottom rails and position of all the rails at top, middle, and bottom at E and F.

Rebate for trellis.

521. But there was more to be done yet before the trellis could be put on, for slips had to be nailed to the inner face of the outer framing, and the outer face of the inner framing to form rabbets or rebates on which to lay and to which to nail the lathing that composed the trellis. These slips are shown in the plan at G and H on the left-hand side of the diagram, and by K and L on the other. Pieces, as a matter of course, of the proper length had to be cut and nailed on between the rails as far as the topmost rails, and then arcs of the proper shape had to be cut out of inch stuff with the compass saw and nailed to the circular work. The proper shape was first obtained by making a template of cardboard, formed by holding a piece of cardboard against the inner edge of the outer framing. This gave the outside line of the arcs required. The outer line was formed by opening the compasses to the distance of 1 inch, fastening the legs with the screw against the iron arc attached to them, so that pressure could cause no

alteration in the distance, and then drawing the points of both legs over the cardboard, pressing heavily on it, and regulating the course of the compasses by following the pencil mark already made on it with the point of one of the legs. This done, the pieces necessary to form the circular part of the rebate were soon cut out with a compass saw, and when they were fitted and screwed into place, any little prominences here and there on either side were quickly reduced by a rasp. The trellis it is better to make independently on the bench. The length required can easily be ascertained. It should, in this case, be made rather wider than is required, so that the ends of the laths can be marked from end to end on both sides in a straight line, formed by means of a chalk line or straightedge. As the distance between post and post is 18 inches, this must be the exact width of the trellis. Get one side accurately marked first of all, and then mark the other side, taking care by measurement to preserve perfect parallelism throughout. Cut one end accurately across at right angles to the sides. Divide the lowest rail on each side longitudinally by a line measured 1 inch from upper surface; this may be done before the rail is screwed on. Continue the rebate in a downward direction below the lowest rail from, say, 3 inches; and then nail to the lower rail and rebate a piece of wood, 18 inches long, 4 inches wide, and 1 inch thick, by way of a gravel board. Lay the trellis in place, and nail down the end, which should butt closely in the rebate, formed in the manner described, against the gravel board. Carry the trellis round, nailing the ends of the laths to the slips forming the rebate, wherever this is practicable, boring holes in every case to avoid splitting the laths. Form a similar rebate by means of attaching a gravel board in the same manner to the lowest rail on the other side. When it can be done safely, cut the other end of the trellis across, and nail it to the bottom end on the other side. A nice finish may be given by nailing a thin strip of lathing, 1 inch in width, over the ends of the trellis to the slips forming the rebate, and across the ends that are nailed to the bottom rail. When this is done, there is no necessity to nail down the trellis otherwise than here and there; but care must be taken to drive the nails through the superimposed lathing into the slips gently and by degrees, lest when the nails are driven through in the intervals between the ends of the trellis, as they should be, the lathing be broken by driving the nails too far into the rebate, or by too heavy a blow of the hammer at the finish. The attachment of the trellis is now completed. The trellis itself is shown sectionally in Fig. 286 at M and N.

Template for circular part of rebate.

Trellis for porch and its attachment.

522. The seat of the porch is in itself a very simple matter. Two blocks, in this case 5 inches in length and 1 inch square, are nailed, as shown at O and P in Fig. 286, to the upper surface of the middle rail in the position shown. A seat is then made of 1-inch stuff, 13½ inches in width and 26 inches in length. Notches, 2½ inches long and 1 inch wide, were then cut in each of the innermost corners, and after a little easing where necessary it dropped nicely into place between the trellis on each side of the porch, the ends resting on the middle rails at E and F, and between the slips G, K, and the blocks, O, P. This, as I have said, was only put in when any one felt inclined to come to an anchor in the porch, and read or smoke the pipe of peace for such time as might suit the occupant, or until its removal was required for ingress and egress. The door of the greenhouse was a ledge door formed of three 9-inch boards, just reduced sufficiently at the edges to bring them precisely to the width required. It was a door with a circular head. There was a circular head to it, and the opening above the boarded part was glazed. It was so put up on the inside of the house as to close against the internal surface of the framing as shown. The mocking by which the panelling was formed was 2½ inches in width all round, except at the bottom, where it was 5 inches wide. The circular mocking at the top was 2½ inches wide, and formed a rebate against which the glass was dropped within. The glass was secured in place by a thin slip of wood easily removable, and was bedded on putty placed in the rebate. The transverse ledge is shown at Q, the boards at R, S, T, the mocking that forms the panels, at U, V, W, X, and the strap or T-hinge by which it was hung at Y. It is fortunate that I have come to the end of the description, for the alphabet is all but clean pumped out in the plan.

Seat of porch.

Door of greenhouse.

523. When I had finished the trellis of the porch, I proceeded to the ornamentation of the external surface of the front uprights. Having no wood that bent readily, I found it a difficult matter to carry projecting ledges round the circular work, into which to drop the 2-inch lengths of the mop-stick moulding. I sought to make such wood as I had at hand amenable to bending by cutting transverse saw-kerfs at close intervals; but the wood was too stiff and too wide for this kind of treatment. I did manage the inner surface, after many trials and at the sacrifice of much time and trouble, as I have shown in Fig. 287, but I was obliged to give up the upper ledge; so I consoled myself, after the manner of the fox who could not reach the grapes he coveted—not that I believe there ever was a fox that hankered after grapes, as Æsop says—by the reflection that if I had done as I originally

intended, the top of the porch externally would have looked rather too plain and lacking in character; so I cut a number of pieces of mop-stick moulding, 3, 4, and 5 inches in length, and nailed them on to the circular work above the ledge, in the manner shown in Fig. 285. The dotted semi-circle defines the width of the part of the head that is hidden by the moulding. This kind of moulding is generally a little more than 1 inch in width, so I had to reduce each piece a little towards the lower end by paring the edge slightly with a chisel. This I did just before putting each piece on, first finding the common centre to which the sides of all the pieces converged by nailing two slips to the inner ledges, and a transverse slip to these flush with the surface of the framing across the part where the circular work began to spring. In this transverse piece of wood I found and marked the centre of the arch at A. I then got the perpendicular shown by the imaginary dotted line, A B, and then I marked the upper end of this perpendicular above B on the external surface of the arch, and after spacing out the quadrants on each side of it so as to produce the arrangement of the rays, as shown in the diagram, I managed to complete the rayed work with fitting regularity. I carried out the marking, I should say, before I fixed the ledge on which the inner ends of the rays rest, and I made the ledge, I feel bound to confess, not of a single strip, but of a number of small pieces. It was not a very good-looking bit of work, and if ever I do the same thing again, which is doubtful, I shall provide myself with wood that will lend itself readily to bending, or build up the ledge in very thin slips. I made it pass muster when done by means of paint and putty, which, as charity does with the sins of mankind, cover any amount of shortcomings in wood working, and if cunningly applied often works wonders in this way. Well, beauty is but skin deep after all, and as frequently in wood work as in those who are classed among the beautiful.

The corona outside the porch.

524. Let us now turn our attention to the diversification of plain surfaces by mocking. There is a great deal that can be done in this way, and a great many methods and modes of doing it; but I will restrict myself to the description of three. They are imitations of stone work in wood, but there need be no attempt to disguise the imitation. Many writers, I know, have lifted up their voices and cried aloud against this kind of thing; but the offence to my mind seems to be, not in the bare fact of imitation, but in the attempt to make the wood look otherwise than it really is. This will depend very much on the way in which it is painted. It would be ridiculous to paint it in colourable imitation of granite or any kinds of

Imitation of stone work in wood work.

marble, but in two shades of stone colour or any kind of marble; but if painted in two shades of stone colour, for example, the lighter colour for the prominent parts, and the darker tint for the retiring or recessed parts, no really fair or tenable objection can be urged to its adoption.

Details of small greenhouse.

525. The little greenhouse, of whose porch a sketch has been placed before the reader in Fig. 285, the lower part of the wall on the right-hand side was of brick. It had been built originally as the side wall of a pit into which all weeds and garden rubbish were consigned that might moulder into manure, and the corner itself was surrounded by trellis work, 6 feet in height, with a door also of trellis, just about where the door of the porch was subsequently placed. It became necessary to mask the exterior of this bit of wall at A -it was just 3 feet in length and make the corresponding part of the enclosure at B, as well as the parts that flanked the porch, to match through and throughout all along the line as far upward as the height of the brick work, and I used the design I am about to describe and illustrate. I have seen it used in interior work at railway stations, worked as I have given it, or very nearly so, all along the platform; so the idea is by no means original. I have given in Fig. 288 a small plan of the greenhouse, not to scale, however; and I give it as it may be helpful to some who may have a similar corner, and not know exactly what to do with it. The arc from D to F is struck in the drawing given, with a radius of 2 inches taken in an extension of the dotted line drawn from the corner, G, through the centre of the porch. I mention this in case any reader may be tempted to make a working drawing in plan on a larger scale for a similar greenhouse for himself. From E and F the arc gently merged into the straight boundaries of the side borders in front of the wall that met in G. The edging to the borders was of box. The reader will now better understand what I meant when I spoke of this greenhouse as a five-sided greenhouse. It is pentagonal, but the plan is by no means that of a regular pentagon.

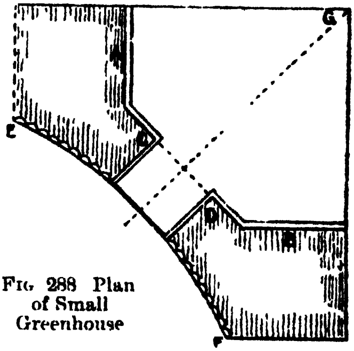


Fig. 288 Plan of Small Greenhouse

How a bit of brick wall was masked.

526. But let us get on to the mode employed to mask the brick work. I will not weary the reader with more than I can help on this part of the subject: it will suffice to say that I first got some boards out of boxes bought of the grocer, and that I nailed these longitudin-

ally and transversely on some battens that were to be placed against the brick work; and having given these two or three coats of dark terra-cotta colour, I proceeded to mark out the surface in the manner shown in Fig. 289. I remembered when beginning to do this that a brick is twice as long as it is wide, and this led me to adopt the same proportion for the blocks shown in Fig. 289, which, it will be found on making measurement, are twice as long as they are wide; and I recommend any one who is inclined to do any work of this kind to preserve these proportions. For example, if the blocks be 9 inches in length, let them be 4½ inches in width; if 6 inches in width, cut them one and all exactly 12 inches in length, and so on. The recessed spacing between the blocks should not at any time be less than ¼ inch, and the intervals should be increased in proportion to any increase in the size of the blocks. I cannot now remember the length and breadth of mine, but as it was but a small job, I think they were 9 inches by 4½ inches, with intervals of ¾ inch. Bond was broken in every course in the manner shown. I cut a sufficient number of blocks and half blocks out of boards about ½ inch thick, first of all; and in order to save making a mess of the paint work afterwards by leaving this till they were placed in position, I painted them all on the front and edges in light terra-cotta colour first of all.

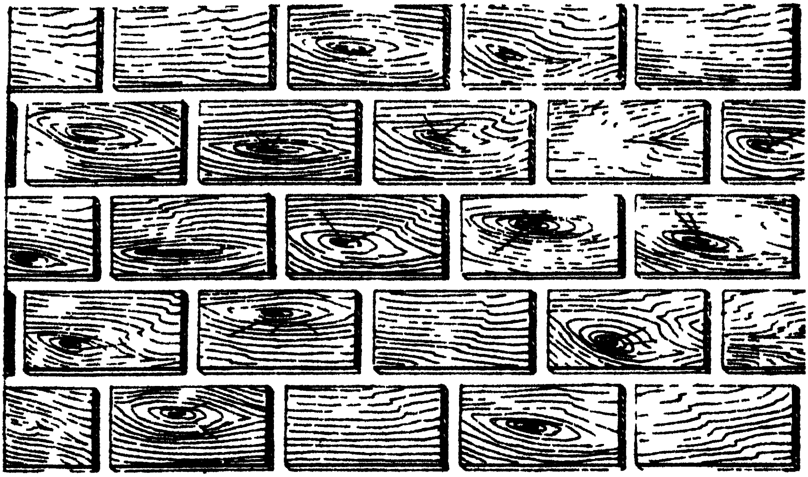


FIG. 289. Mode of Treatment to produce Imitation of Masonry in Wood

Dimensions of blocks.

527. I commenced by putting on a stout piece of wood, 1 inch thick

and 6 inches in width, bevelling the upper edge in a downward and outward direction to throw off any wet that might fall on it; and then I proceeded to fix the blocks to the boarding I had first prepared, driving in the stoutest ⅞-inch wire nails I could get from the back of the boarding through it and into the back of the blocks, thus saving any disfigurement of the paint work already done by punching in the heads of the nails, and filling the holes thus produced with putty afterwards. With regard to the attachment of the masking thus prepared to the brick work, I had plugged the brick wall in six places, having accomplished this by careful measurement, and I had provided for the attachment of the whole to the plugs by making screw holes suitably countersunk—two in the first recess, two in the third recess, and two just above the gravel board. These I had to putty up of necessity after the screws had been driven home with a turnscrew, but the putty was soon hidden with a touch or two of paint, put on with a fine brush. The work was carried on all round the base of the green. house at A, C, D, and B; but as the remainder of the framing of the house was of quartering, the attachment of the exterior was an easy task compared with that of boxing the first piece to the brick work. The wood work was suitably mitred together at the angles between A and C, and D and B, and finished all along the top by a bevelled coping on which the next stage of imitative work was superimposed; but the description of this work, which involved another kind of mocking, must be left for another section.

Attachment of blocks to boards.

528. But before entering on this, I will suggest to the amateur that if he is in a hurry and wishes to vary the work, he may manage this by nailing strips of wood from ¾ inch to 1½ inches wide and ½ inch thick to the boarding, be it what it may, along the lines horizontal and vertical shown by the recesses in Fig. 289. If such work as this were chamfered, and especially stop chamfered, it would produce a very pretty and pleasing effect. The only thing to be said with regard to the chamfering is that to do this neatly and nicely the amateur must not be in a hurry, and we started on this tack as the sailors would say, on the supposition that the amateur had not got much time to spare, and was in a hurry; but suggestions as to treatment of work will offer themselves as I proceed, and I cannot help taking notice of them and committing them to paper, under the hope that some reader will find them useful at one time or another, as everything is said to become useful once in seven years.

Alternative style of treatment.

529. Several years ago, before I had even thought of commencing *Every Man his Own Mechanic*, a method of house building was invented

and brought into fashion by Mr. W. H. Lascelles, builder, then of 121 Bunhill Row, London, E.C. Reference to that volume tells me that the building material to which I refer was introduced about the year 1875. It was called Lascelles' Fish Scale Tile Slab. The form shown in Fig. 290 was used for external work, plain slabs being used for this purpose also, and for lining of walls as well. The slabs were 3 feet in length, 2 feet in width, and 1½ inches thick. They were fixed to the framework by screws driven through the slabs and into the wooden framing. Building in this mode by means of the slabs attracted considerable attention at the time and evoked much enthusiasm, for it progressed with great rapidity, as a very large area could be covered in in a very little time. But somehow or other, it did not "catch on" permanently, as our cousins across the Atlantic say, and I merely allude to them here to account in a satisfactory manner for my imitation of them in wood.

Lascelles' fish-scale tile slab.

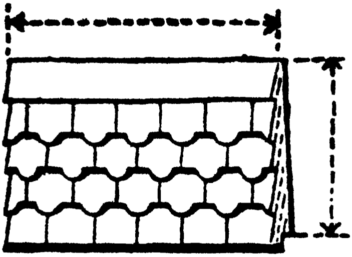


FIG. 290. Lascelles' Fish-Scale Tile Slab

530. I had had one of these slabs for some time not for seven years though—and it was becoming a kind of white elephant that I did not know what to do with: first showing itself in this corner and then in that, until I got weary of the sight of it. Nevertheless, I stuck to it, and was at last rewarded for my careful preservation of it by finding myself able to give it a resting place for good and all on the brick work at A in Fig. 288, where it remains to this day. Its being there compelled me to find some mode of imitating it in wood in order to carry the zone round the greenhouse above the imitation of "sunk" work in masonry shown in Fig. 289. In the regular article, the edges of every alternate scale in the row are raised above the scale on either side of it. Now it is possible, but certainly not profitable, to imitate even this; but "the game assuredly was not worth the candle"; and so I decided on letting this part of the business alone: but I will tell the reader what I did and how I did it.

Imitation of fish-scale slab in wood.

531. On looking at the representation of the slab as given in Fig. 290, it will be noticed, on close and careful examination of the edge of the slab on the right, that the face presents five rows, inclined downwards and outwards like feather-edged weather-boarding; and that the row at the top is plain, the three intermediate rows consisting of scales with well-defined edges, and the

row at the bottom divided into scales, but plain along the edge. At the back of this was a rebate which fitted on to and over the thin upper edge of the topmost plain row of the slab below, and prevented ingress of water in the form of rain, which was, on its arrival there, compelled to trickle onwards and downwards over the slab below. The weakest point about the slabs was the vertical joint at the sides: these were fitted together with what is termed a "putty joint," but water used to penetrate sometimes, and dampness was the result. There are defects, however, in every kind of building, as all who have sought the assistance of Mr. Gerribilder are well aware. Nevertheless, when the concrete slab walls were completed with lining slabs within, and the intervening space between the outer and inner slabs was filled with sawdust or any non-conducting material, the houses and cottages thus built were warm and cosy enough.

Construction of slab.

532. I will now proceed to show how I made a very successful imitation of these fish-scale concrete slabs in wood work, and the reader will probably think that it was done with weather-boarding, or, in other terms, with feather-edged boards. The principle of overlapping every board by the edge of the board immediately above it was indeed resorted to; but feather-edged boards would have been useless for the purpose in view, because they are not of uniform width, and are too thick at the lower edge for cutting out the ornamental work that forms so conspicuous a feature in the slabs. It will be worth while here for the instruction of the home carpenter to examine the principle of weather-boarding, and the manner in which it is cut, and to contrast with this the method I adopted in putting on and cutting out my fish-scale boards. Fig. 291 is a sectional diagram, showing how weather-boarding or feather-edged boarding is cut. A board, say, 1¼ inches or 1½ inches thick, is cut diagonally so as to form two boards, in each of which one edge is thick and the other edge is thin. As far as I remember, not having a piece of feather-edged boarding by me at the present moment, the thick edge is about twice as thick, if not more so than the thin edge. The mode of attachment to framing of quartering, etc., is shown in Fig. 292. In this the lowest board is shown nailed on flat to the quartering. Practically, none of the other boards above overlay the quartering in this manner. Supposing them to be perfectly rigid, they would merely touch the board below at the lower inner edge, as B is shown to touch A, and the quartering C with the upper inner edge; but actually they are not rigid, but apt from their shape to curve inwards, especially when nailed up; and so the thick edge of B is flattened on to the thin edge of A, and when the

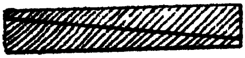
Imitation of slab in wood work.

Weather boarding.

thick edge of D, the board above B, is nailed to the quartering C, the nailing down produces the same result, and the boards become very slightly hollow and not perfectly straight, as shown in the illustration. Weather-boarding is very rapid work, and may be much resorted to by the amateur wood worker for opening the external skin, if I may use the expression, of many a wooden structure erected in the garden and grounds. If it is to be painted, it is better to rub over the outer surface with the jack plane, in order to get a smoother surface, which will take the paint better. If left rough it may be dressed over with Stockholm tar. Always use Stockholm tar in preference to coal tar. The former is clear and transparent, the latter is thick and black: there is, in fact, as much difference between the two in appearance as there is between golden syrup and green treacle.

Mode of attachment.

FIG. 291.



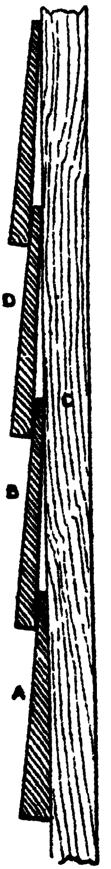


FIG. 292.

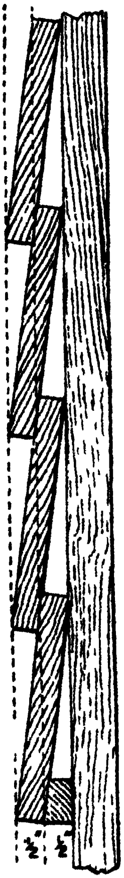


FIG. 293.

Fig. 291. Method of Cutting Board diagonally so as to form Weather Boarding.
Fig. 292. Example of Mode of Nailing Weather Boarding to Framing of Quartering.
Fig. 293. Mode of Fixing Boards cut in Imitation of Fish-Scale Concrete Slabs.

533. I used ½-inch boards nicely planed up for my imitation of fish-scale slabs, as they were to be painted, and I put them on as shown in Fig. 293. As I wished them to lie perfectly flat and unbent in position, I started with nailing in a piece, slightly bevelled upwards, on the outside, on which the lower edge of the lowermost board could lie and abut. Thus, supposing that my boards were ½ inch thick, as they were, I made my starting slip ½ inch thick or thereabouts, as shown by the dotted lines running from top to bottom, and bevelled it as exhibited in the illustration. So the lower edge of the first board put on lay perfectly flat on the top of it, and I just ran the plane slightly over the upper inner edge that the reduction by a mere shaving or two might bring it flat against the framing or boarding at the back for a short distance. It was then that I prepared my boards, and it was in this manner that I ultimately attached them; but there was yet much to be done before they could be

Boards for imitation of fish-scale slabs.

nailed up in position, for the edges had to be cut to imitate the fish-scale style of ornamentation, and to do this a deal of patient measurement and marking out had to be done along the edge of each board, and then the edge had to be cut out with the utmost care with keyhole saw or compass saw, and finished with the aid of the chisel, as shown in Fig. 294.

Preparation for attachment.

Ornamental work in imitation of fish-scale slab.

534. I have given this on a tolerably large scale, so that it may be as helpful as possible to the home carpenter. The general appearance in front elevation is shown by the entire figure, but it will be enough to make reference to one board only in describing the mode of marking and cutting out. Let us take it that the lower edge of the topmost perfect line of tiles is represented by the dotted line A B, and that C D represents the upper edge, which is hidden from view in the work itself by the ornamental edge of the board above it. The dotted line E F shows the upper edge of the board immediately below that which is under consideration. The first thing to be done is to determine the depth of the indentation, and we will put this at the line G H. We must then divide the surface of the board into equal spaces, as shown by the vertical dotted lines at K, L, M, N, and these must be subdivided by other vertical lines, as shown by the dotted lines O, P, Q, R, and the solid line S. Subdivide these spaces, or rather semi-spaces, again into equal parts, as shown at T, U, V, W, X, Y, Z, I, J. There! the alphabet is completely exhausted now, even though the letters I and J so seldom used have been pressed into the service Now, the next thing that must be done in order to define the course of the

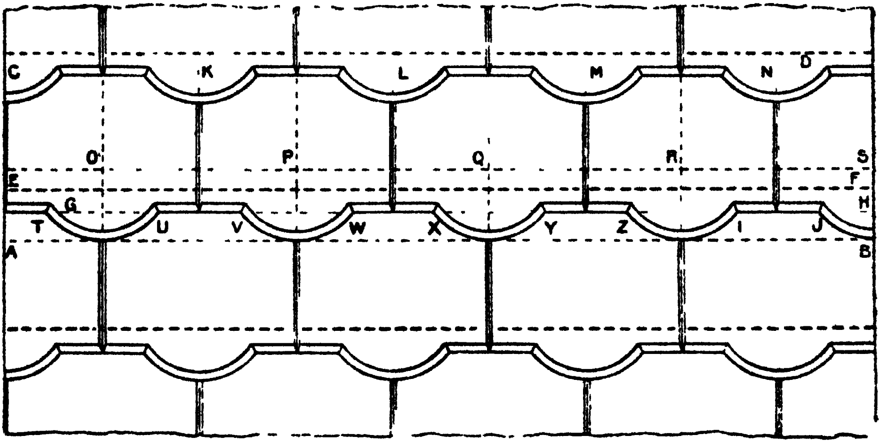


FIG. 294. Ornamental Edging of Boards in Imitation of Fish-Scale Slabs.

Marking out.

Describing arcs.

lower edge of the board is to draw the arcs that are shown between T and U, V and W, etc., to the semi-arc from the point S, and the centres from which these arcs are struck must be found. It would tend to complicate the figure to too great a degree by showing the lines by which this is done diagrammatically; but you must draw straight lines from T and U to the bottom point of the vertical line O. Bisect the lines thus drawn, and at the points of bisection draw perpendiculars to them. These perpendiculars will meet and cross each other in the point O, which is the centre from which the arc T U must be struck. Do this again between the points Z and I in order to find R, the centre from which the arc Z I has to be struck. Practically, this would be equivalent to finding the centres of these arcs at the two ends of the board. The centres of all intermediate arcs are found at once by drawing the dotted line horizontally from O to R, and extending it in both directions: the points P, Q, and S, in which it cuts the vertical lines first drawn through these points, are the centres of the arcs V W, R Y, J B. Saw out the arcs with a fine keyhole saw, and remove the portions that remain between and adjacent to them at T, and from U to V, W to X, Y to Z, and I to J, with a sharp chisel. To complete the ornamentation, chamfer the edge all along, as shown by the inner arcs and straight lines, and take out the narrow grooves between the tiles shown vertically with a V-chisel.

Divisions between tiles in fish scale slab.

535. I have said that the edges of the alternate tiles were raised in the actual slab itself. In my imitation, the division between them is made with a V chisel, as I have said, and is nothing more than a deeply cut line. In the real article, the form of the edge when viewed from below is as shown in Fig. 295, and the face of every alternate tile that had raised edges on each side was hollowed. To do this in the imitation, a thin bit of flat wood must be bradded on over every alternate tile, and the whole surface of the tile would have to remain raised. Every slab, the reader must remember, is cast in a mould; and to produce the effect shown in the slab when cast, the only thing to be done in making the wood mould from which the concrete slab was cast, was to make cuts in the material with a sharp chisel, as shown at B and C, and then to slope away the material from the middle of the tile at A towards the cuts at B and C. It is possible that some amateur may ask if he individually could cast concrete slabs?—to which I will reply in anticipation, "Undoubtedly, yes!" First prepare the face of your mould, in which all parts will be depressed that are prominent

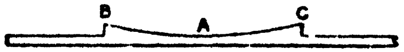


FIG. 295 View of Edge of Alternate Scales in Fish-Scale Slab

in the casting. Put an edging round the face of your mould, 1½ inches in depth above the surface, so that you will get a slab 1½ inches thick. Fill the mould with concrete, made of cement formed of fine sand or road grit, fine coal ashes, and good cement in equal proportions. Fill the mould with this, and leave to dry. When perfectly set and hard, turn out the slab and fill any air holes, etc., in the face with concrete similarly made. You may make any amount of slabs in this way, ornamented or plain for paving, etc. And, what is more, you may make them of any colour by mixing coloured ochres or earths with the cement, and even rough attempts at tesselated paving by putting in very thin divisions, say of iron, steel, brass, or zinc, in the moulds, and filling these with cements of different colours first of all, and then completing the filling with a backing of ordinary cement. In this way, black stars may be shown on a white ground or *vice versâ*, and any simple and easy device that may suggest itself to the imagination of the operator. The devices should be made in thin zinc, which is easily cut and worked into the form desired, and the outlines or matrices for the patterns should be left in place, to secure the necessary sharpness of outline to the design.

How to make concrete slabs.

536. It has been well said that there is no knowing what one can do till one tries, as in the matter of the cement slabs above described. I now give the home carpenter in Figs. 296 and 297 some further patterns in imitation of tile work for his guidance. Both are made in the same way as the imitation of the fish-scale slab. There is no necessity for me to say anything about the method to be followed in working these, or much with regard to the designs themselves. The ornamental forms of tiles are rendered by the semi-circle and right angle. They may be used in such a

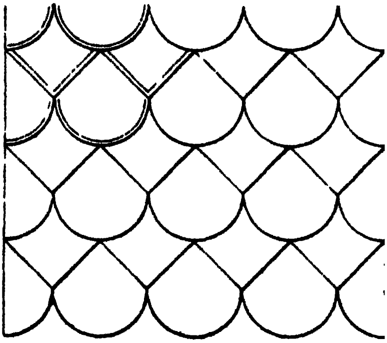


FIG. 296. Imitation of Tiles in Wood

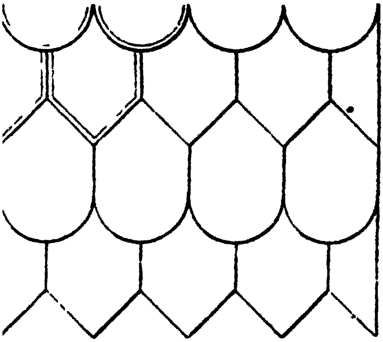


FIG. 297. Alternative Imitation of Tiles in Wood.

Imitation of tiles in wood work.

way that the central point of every semi-circle touches every point of the rectangular V-shaped tiling below, as in Fig. 296, or in such a manner as to give greater elongation to each tile, as in Fig. 297. Of course, the elongation may be carried to a greater or less extent, as the pleasure of the wood worker may determine. Both patterns are suggestive only, and may be modified to any extent. The effect produced well repays the trouble involved in every case in producing it.

537. Imitation of tile work in wood may be very effectively rendered by the adoption of the regular polygons, the six-sided hexagon, and the eight-sided octagon, as the keynote or keynotes of the work, as used either singly or in combination with other forms. It is the easiest matter possible to cover in this way an entire surface with a complete system of hexagons, in the same fashion as the honeycomb wrought in this form with unerring instinct by God's mathematicians and artificers, the busy bees: some of which cut circles out of rose leaves as truly as though they had been defined by compasses. In this case as in many others, God's animals show the way; and man has but to study their ways, and follow in their wake to gain success in many an invention that shall prove of service and importance to his fellow men.

Regular polygons for tile work.

538. I have urged very much on the home carpenter the use of mop-stick mouldings in decorative work. I have already said so much on a large variety of subjects that at times I quite forget what I have said, and cannot remember whether I have dwelt on the advantages of wood rods, ½-inch square rods for panelling, borders, etc. An effective border in the solid may be made by arranging small lengths of this stuff in the form of lintels interchanged as in Fig. 298. I have spoken of this for the heading of panels as shown in Fig. 299; for although I have said much I am always impressed with the consciousness that I have left much unsaid, and could say more. The diagrams here given speak for themselves. They will be found useful for ornamental work in the house as well as the garden. Both

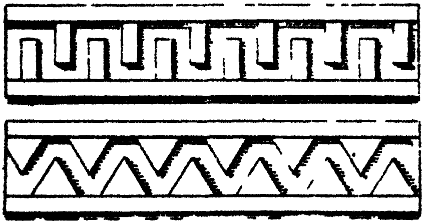


FIG. 298. Mocked Work for Fillets, etc.

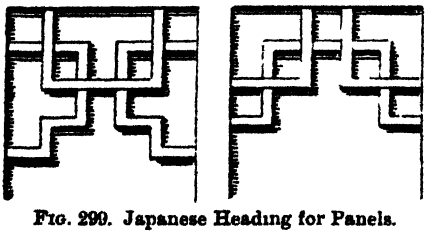
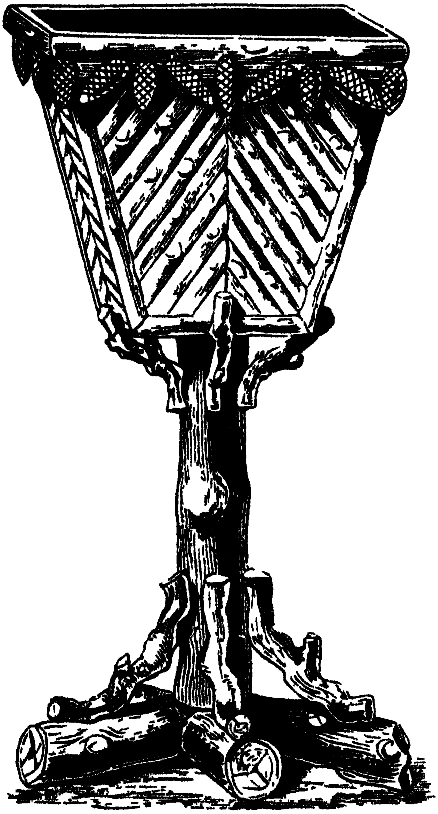


FIG. 299. Japanese Heading for Panels.

the mocking for the fillets, facias, architraves, lintels, and jambs, etc., and the Japanese headings for panels, may be used freely in all outdoor work as well as in indoor work, and especially in greenhouses, verandahs, porches, etc. I am myself extremely partial to this kind of work wherever it can be introduced; and if it be sought to know why I am so, my reply and reason will be found in the words—*It redeems all plain work from the commonplace.*

Lintels and blocks for fillets.

Japanese headings for panels.



Rustic Vase for Flowers

CHAPTER VII.

GARDEN ARCHES, STEPS, BRIDGES, PERGOLAS, ETC., ETC.

Effect of Decorative Work in House and Garden—Decorative Work suitable for Gardens—Poles as Materials for Arches, etc.—Garden Arch of Rough Poles—Dimensions of Poles and Arch—Construction of Sides of Arch—Garden Arch in sawn Wood—Sides of Arch—Position of Arch in Border, etc.—Garden Arch in Rustic Carpentry—Rustic Bangle Work—Materials for Rustic Carpentry—Time for Cutting Timber—Larch and Fir Poles—Oak Bangles—Elm and other Woods—Hazel, Maple, and Wych Elm—Constructive Work in Rustic Carpentry—Joints in Rustic Carpentry—Forms of Garden Arches—Tops of Arches—Forms of Arches at Top—Ornaments and Finials in Garden Arches—Details of Finial—Rose Temple in Wire—Rose Temple in Wood—Top of Rose Temple—Construction of Square Pyramidal Top—Construction of Top—Pyramidal Top to Rose Temple—Cresting to Wallplate of Rose Temple—Formation of Octagonal Pyramidal Top—Increase of Height of Top—Pyramidal Top formed by Boards—Platform in Corner of Garden—Construction of Platform—Good Intentions—Miniature Spire—Support for Spire—Construction of Spire and Ribs—Connection of Ribs with Framing and Top—The Pergola—Its General Character—Construction of the Pergola—The Pergola as an Arcade—Inclines in Garden Ground—Forming Slope for Steps—Containing Curbs for Steps—Construction of Containing Curb—Steps without Side Supports—Step Bridge across Path—Principles, Dimensions, and Materials—Parts of Step Bridge and Construction—Alternative Form of Step Bridge—Bridge over Dyke—Bridge over Roadway, etc.

Effect of decorative work in house and garden

539. It is an axiom generally received and generally acted upon in the decoration and equipment of the house within to have salient points, which may at once arrest the eye, and, by attracting it from one point to another, lead the looker-on to suppose that there is more in the room than any one would think from a first impression with regard to its size when entering it; and insensibly this first impression is merged in the thought and feeling that a room that contains so much to interest must be larger than it was supposed to be at first. By this it must not be supposed that I mean a room that is cumbered with too much furniture, or has so much trumpery in it here and there that it looks more like a second-hand goods shop, than a room adapted for social comfort; but a room that by the tasteful combination of a few good articles of furniture, a good picture or engraving here and there,--a piece of statuary in one corner, a choice floor lamp in another, and so on,—makes it what it really is, a room meet for an English gentlewoman. And so it is with garden ground; for if two pieces of the same

size be taken, that will appear to be the larger which contains more to interest the observer and catch the eye. And what better tends to do this than such things as some tasteful garden arches here and there "with verdure clad," however plain and simple they may be in character,—steps leading from higher to lower levels instead of slopes, short and abrupt in character, down which you "go with a run,"—a bridge over a border which will save the border itself from the trampling feet of those who would cross from lawn to side path or *vice versâ* by forbidden ways,—and a pergola of rough poles perchance, by a wall clothed with creepers and climbers, which will carry them onwards and outwards in their growth, and create a pleasant shade in summer when the meridian sun is at its hottest and its highest?

Decorative work suitable for gardens.

540. At my last residence, I found that it was infinitely easier and cheaper to get poles, large and small, than pieces of quartering, and I took to the materials which were most readily obtainable in the locality, to make garden arches and other kinds of embellishments of which the garden sadly stood in need. Nice stout poles about half as long again and twice as stout or more so as a bean pole, ruled at 6s. per hundred, and good thick poles, as big as one's fore arm, were to be bought at 2d. or 3d. a piece. I wanted some supports for climbing roses, so I put up a few here and there in the manner I am about to describe. I am going into a little rough and ready carpentering now, very different to the exact work with rule and compass, with which I have been dealing hitherto. My tools, too, were somewhat different. I had to use measuring rod, saw, bradawl, gimlet, hammer and chisel before, but in addition to these I was obliged to resort to the bill hook, the chopping block, and a long bar of iron known in hop-growing counties as a "pitcher".

Poles as materials for arches, etc.

541. A sketch view of the arch or *quasi* arch that I made is shown in Fig. 300, and these I made and put up in various parts of the garden. They are a little bit Japanesque in character, and look perhaps better on the ground than they do on paper. At all events, they satisfied me; and although I am always, or very nearly so, pleased with the work of others, I am seldom much pleased with my own; for in nine cases out of ten, just when I have finished the work, other and better ways of doing it seem to suggest themselves. The way in which they were made was simply this. Four holes were made with the pitcher on each side of the path, which was spanned by the arch, and in these four poles were placed that measured about 7 feet from the ground level to the top of each. These are shown in side elevation in Fig. 301; for as the sketch view from its picturesqueness may be less com-

Garden arch of rough poles.

prehensible to my readers than I wish it to be, I have given a front elevation and side elevation in squared rods, which will serve the purpose of rendering the structure in poles more readily understood by the wood worker, and enable any one who wishes to make such an arch with wooden rods from the wood yard about 1¼ or 1½ inches square to do so. The arch itself, as shown in Fig. 300, was about 3 feet square at the base, and about 6 feet 6 inches in height, or above the ground level, measuring up to the cross bar that is shown in front. The poles were, as I have said, rough, and in some cases, rather crooked; but I managed to make them look tolerably straight by nailing with long wire nails, long enough to be driven through for about ½ inch, and bent over and clenched on the other side. There were six bars on each side, and therefore on each side there were six rows of three openings, one above another, 12 inches square.

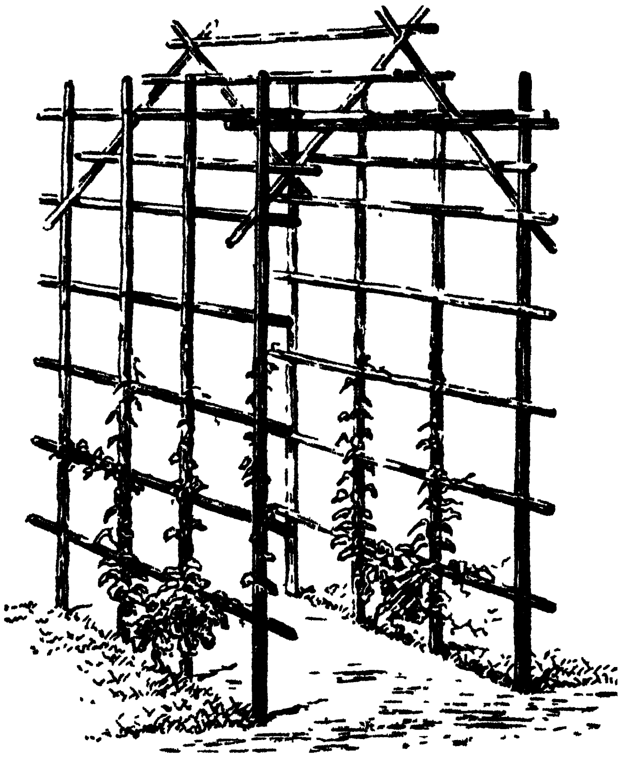


FIG. 300. Garden Arch made of Rough Poles.

Dimensions of poles and arch

The poles themselves were about 1½ inches in diameter at the bottom, and, of course, tapered thence to the top. They averaged 1 inch in diameter, where they were cut off at the top. When the poles were first set in the ground, the whole affair looked a regular "go-as-you please" business; but I had prepared a rod marked into spaces of 12 inches clear, with 1 inch intervening between each space; and at each end I cut or rather scooped out a semicircular notch from ¼ inch to ⅜ inch in depth, and I marked spaces on the pieces of pole that were to do duty as side rails. When this was done, "regulation drill" commenced; and my posts soon began to bear about the same semblance to themselves in their original state as men who have been well "set up" by the drill sergeant do to the original material in the form of the raw recruit. Ah! how much do I glory in turning men into military machines? To me it would have been a task as congenial as ever it was to Frederick the Great of Prussia, and Charles of Sweden, the hero of Narva; but it pleased God that I should do my "soldiering" in the "Battle of Life" instead of on the battle field; and having done it hitherto in strict obedience to His general order, "Whatsoever thy hand findeth to do, do it with thy might," I trust I may have done it well enough to have won my spurs in His sight.

Construction of sides of arch.

542. And this is how I "set up" my poles. Of course, for the purpose I had in hand, I picked out the straightest I could find; but some of them were unco' crooked for a' that. I began by nailing the straightest of my cross rails, which I cut to the length of 3 feet 4 inches, so that the ends might project for about 2 inches beyond the corner poles; and then I got the rest as far into the same plane as possible by bringing upright and rail together by force, and holding them together until the entire side was securely nailed at every crossing, and the points of the nails beaten down and firmly clenched. The poles and bars thus brought into touch could not start asunder, for the wire nails held on like grim death, and utterly prevented anything in the shape of a divorce; so let no one who tries to make an arch of this kind despair of getting right in the end on account of first experiences. His attempt will end well, and then he can say, "All's well". When I had done this, I put on the cross pieces, which form, as it were, the lintels to the openings at each end, and the diagonal poles which spring from the second rail on each side; and after crossing the cross piece, cross each other at the top in X form. These crossings form resting points for the rail that forms the ridge of the arch, which I completed by nailing three cross rails to the diagonals on each side between the ridge bar and the second rail of the side. When the structure was complete, it looked well enough; and when the climbing roses had reached the top and fairly covered the arch, the skeleton look of the structure was neutralised by the floral drapery which was thus cast about it.

543. I must now say a few words with respect to the diagrams which exhibit the construction of an arch in sawn wood, and therefore straight rods similar in form to that which has just been described. These will be found

Garden arch in sawn wood.

grouped together in Fig. 301, in which A shows the side elevation, B the end elevation, C the plan, and D the plan of the top viewed from above. Like the other, it is but a skeleton arch; but the framework is amply sufficient as a means of support for climbing roses. The uprights and cross rods in all parts may be halved together at the crossings, or notched to the depth of one-fourth the thickness of the rods for the purpose partly of securing crossings at proper intervals, and partly as a means of regulating the work. Halving, however, will, I think, be found to be the best and neatest mode of making the arch, as being the only way by which to steer clear of any clumsiness of appearance. In the diagrams given, I have not shown the parts of the uprights that enter the ground; but it must be understood that each upright must be cut about 18 inches longer than it is shown to be in the diagram, so that due allowance may be made for securing it firmly in the ground. I would recommend the home carpenter to make the sides first of all, fitting and nailing all the parts together. I would then nail temporary slips across from one side to the other to keep them in the form and relationship that they will ultimately have to occupy, and then I would fit on the rail forming the cross bar of each end, halving it into the topmost cross bar of the side, which should be cut about 2 inches longer than I have shown it to be in the diagram, or even longer than this

Sides of arch.

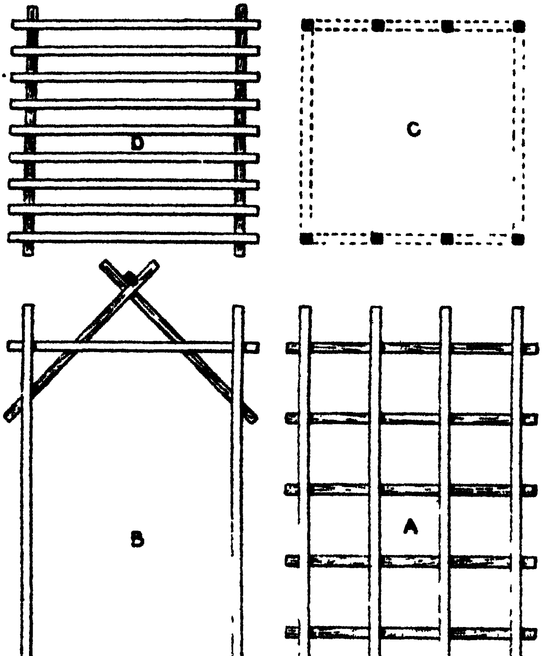


FIG. 301. Framework or Skeleton of Garden Arch shown in Side Elevation (A); End Elevation (B); Ground Plan (C), and Plan of Top as seen from above (D).

for the ends can always be shortened back, and it would be a matter of the greatest difficulty to lengthen them in any way compatible with strength. When this has been done, and the horizontal cross rail and diagonal rails at each end over each opening have been screwed on, the transverse rails parallel to the cross rails of the sides may be halved to the diagonals and screwed on. These rails are shown in the plan of the top viewed from above, as given in D, in which the rail immediately above the letter D is the ridge rail, whose ends rest in the forks or crossings made by the ends of the diagonal pieces, one of which is shown in section at the very top in B. When this has been done, the whole structure can be lifted bodily, and the ends of the uprights dropped into the holes made in the ground for their reception, as shown in plan at C. I counsel this mode of making, for it is much easier to handle and deal with anything of this kind before it is placed in position than it is to deal with it when it is in progress, as was done in the case of the arch made with rough poles. Many modifications of this form will, without doubt, suggest themselves to the amateur wood worker; but I cannot enlarge on this part of the subject here.

Position of arch in border, etc.

544. When the garden arch spans a path with a border on both sides of it, or with a border on one side and grass lawn on the other, the amateur should bear in mind that the sticks of the arch should enter the ground on the border side of the edging, and have a strip of the lawn equal in breadth to the breadth of the edging on the opposite side. Now, in the garden in which my arches of rough poles were put up, there were borders on each side of the path that was spanned by the arch; these were separated from the pathway by verges on broad edgings of turf 12 inches in width. Therefore, my arches were in some cases as wide as the width of the path, say 2 feet 9 inches, plus 2 feet for the grass verges on each side; so that in reality their width varied from 3 feet to 5 feet according to circumstances. I mention this in order to show that the method of construction that I have been endeavouring to show in Figs. 300 and 301 must not be taken as a hard and fast rule for dimensions, but that it is merely the method I have been seeking to show. In every case of making a garden arch, the home carpenter must cut his coat in accordance with his cloth, or, in other words, be guided by circumstances.

545. I will not go very deeply into the mode of making garden arches in rustic carpentry, seeing that this part of the subject has been already handled more efficiently than I could hope to do it by my friend Mr. Arthur Yorke, in a volume bearing the title of *Carpentry for River and Garden*,

published by the publishers of this work, and edited by myself. Quotations from other books by other writers have been conspicuous by their absence in this volume up to this point, so I may be forgiven for making a quotation or two and having a small game all to myself of "follow my leader" here; and even this is not, strictly speaking, a quotation, but rather an adaptation of what he says sufficient to suit my purpose. The illustration given is from Mr. Yorke's facile pencil, and shows to perfection what may be done in this way in rustic carpentry. "This arch and all arches constructed in this manner will be found to be picturesque from all points of view. It is shown as chiefly constructed of rough framing of larch or fir as far as the posts and rails are concerned, with the sides partly filled up with rustic bangle work put in at random. The design might be varied by filling up the whole of the framework within the spaces shown between the rails in the same manner. The height of the posts of such an arch might be put at 6 feet above the ground line; the example given is supposed to be 2 feet 6 inches in width, but the width must be regulated by the width of the path.

Garden arch in rustic carpentry.

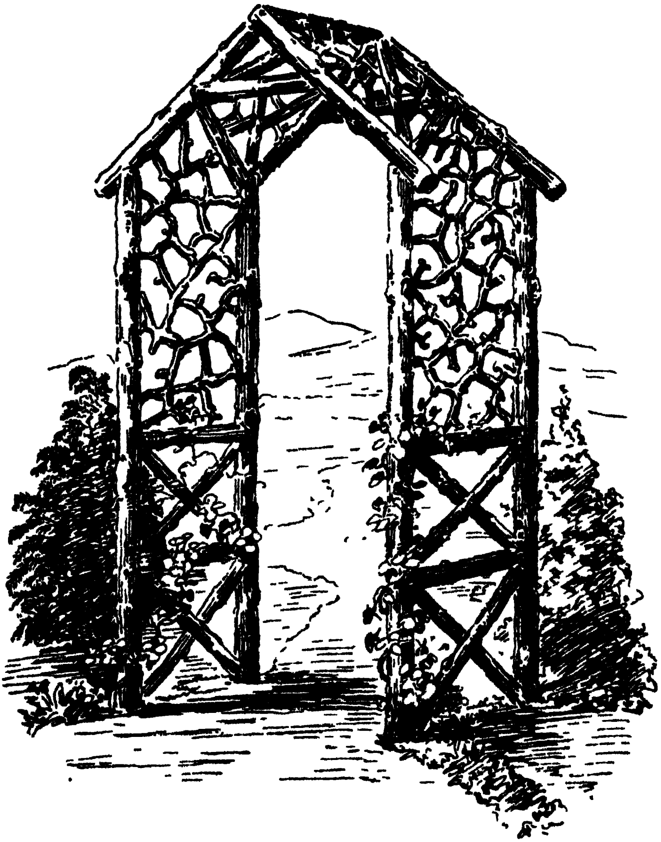


FIG 302 Garden Arch in Rustic Carpentry

Rustic bangle work.

546. " As a rule, wood for rustic work is more pleasing to the eye when covered with its bark, and is therefore generally used in that state. Yet, it must be admitted, that in exposed situations the loose texture of the bark causes it to retain moisture, and thus to hasten decay. In some woods the destructive action of the bark is very marked. Country carpenters aver that withy lasts twice as long when peeled. Whenever it is intended to retain the bark, and to have it adhere closely, the wood should be cut down in winter after the sap has fallen and before it begins to rise again. But if peeling is intended, the wood should be cut when the sap is rising in full force—that is, just as the young leaves begin to appear. Of all kinds of wood none are of so much value in rustic work as larch poles. Their straight and regular growth admirably fit them for constructive purposes, and cause them to be easy of adaptation to regular designs. For the heavier work in summer-houses, arches, fences, etc., they are unrivalled. Larch has also extraordinary powers of endurance. Among our common native woods it stands second only in this respect to heart of oak. Larch plantations now abound in most parts of the country; and when these receive their periodical thinnings the rustic carpenter can generally get a supply at a cheap rate. Various other trees of the same family, such as the silver fir, common fir, and spruce, furnish poles equal for our purposes to the larch in all respects but one. They have the same symmetrical growth, but they are considered far less lasting. Those larch and other fir poles are best which grow in thick plantations. But few lateral branches are then thrown out, and the trunk tapers almost imperceptibly. The branches of such poles are few and worthless; but where the trees grow in more open situations, the branches afford straight and valuable material for light work.

Materials for rustic carpentry.

Time for cutting timber.

Larch and fir poles.

547. ' For that description of rustic work in which little or no regular design is attempted, the smaller branches of the oak—technically known as oak bangles have long been in favour. These are commonly found stripped of their bark, which has been removed for the purposes of the tanner. Contrary to the general rule, these branches look best when peeled. To find a piece of oak bangle in any way approaching to straightness is exceptional, and, as a rule, they are twisted, crooked and contorted in all directions. They can, therefore, only be used in open work where a space can be filled in very much at random. For effect they depend on their rough, grotesque and picturesque appearance. In my own opinion, however, these qualities tell best when they can be brought into contrast with more

Oak bangles.

formal lines, as in a panel in which the boundaries are of straight pieces of fir. Being all or nearly all sap, oak bangles quickly decay. Elm branches may be used for the same purposes as oak, but, whilst less grotesque, they are exceedingly irregular. In exposed situations—the vulgar belief to the contrary notwithstanding—they are much more enduring than oak. Oak lasts reasonably well, but is decorative neither in colour nor form. Withy is, in many districts, the most cheap and available of woods. Though far inferior in beauty and regularity to branches of the fir kinds, it is always to be found straight enough for geometrical work on a moderate scale. If peeled, its beautifully white colour will render it pleasing by contrast when used in combination with other woods wearing their dark barks. For employment in irregular grotesque work in the same manner as oak bangles, apple-tree wood forms a useful material; and special attention is directed to it, as it is one frequently to be had for nothing. In most gardens it is occasionally necessary to cut down an apple-tree The tree so removed is usually at once condemned to the fire. It would be well first to make sure that no part of it is proper for rustic work. Apple branches are far harder and more enduring than those of oak, and equally fantastic; particularly when, as is often the case, the surface rises into grotesque knots and excrescences. For some minor purposes, especially when they can be used under cover, as in the interiors of summer-houses, hazel rods will be found useful. Their glossy and well-marked bark renders them highly decorative, and they are generally to be found sufficiently straight. They are to be obtained from the clearings of undergrowth in woods, and their market value is merely that of fire wood. Sticks also of maple and wych elm of the same size—one to two inches in diameter—are useful for somewhat similar purposes. Their curiously roughened bark, which, on a small scale, resembles that of the cork-tree, renders them pretty. In many parts of the country they grow plentifully as 'stools' in hedges, and are to be had at firewood price when the latter are cut."

Elm and other woods.

Hazel, maple, and wych elm.

548. From the preceding sections the home carpenter will gain a good idea of what rustic carpentry is, how it is done, and what materials are most used and most effective in carrying it out. It should be fastened together with wire nails, and, in building summer-houses and connecting the different parts care should be taken to give stability to the structure by notching the timbers in such a manner that wallplates, so to speak, consisting of round poles, may rest securely in rectangular notches cut in a V shape in the top of the uprights, and that rafters are notched in such a manner at the ends

Constructive work in rustic carpentry.

that the horizontal part of the notch, when the rafter is placed in a sloping position, may rest firmly on the upper side of the wallplate, while the vertical part of the notch butts firmly against the inner side, as it meets with a firm resistance to the outward thrust which it exercises. When poles are nailed horizontally to slanting rafters or slanting pieces of any kind, a notch, consisting of two planes, one as vertical and the other as horizontal as it is possible to make it, should be cut in the slanting piece and out of the horizontal pole; wherever it touches and rests on the slanting piece, it should be rendered fit to rest securely in the notch made in the other piece by cutting a slice vertically out of the inner side and horizontally out of the bottom or under side, so as to rest firmly and securely in the notch cut in the other piece. The nature and character of this notching will be fully understood by reference to A, B, C, in Fig. 303, in which the three kinds just described are clearly represented. In D and E two other kinds of joints are shown. In D we have an example of two wallplates meeting and resting on an upright, having been halved and notched together. On these the end of a rafter is imposed, which may occupy a position in the same plane throughout as the wallplate immediately below it, or be a diagonal rafter. In E the ends of two rails meeting at right angles are let into an upright which is notched suitably to receive them. For these joints I am indebted to Mr. Arthur Yorke.

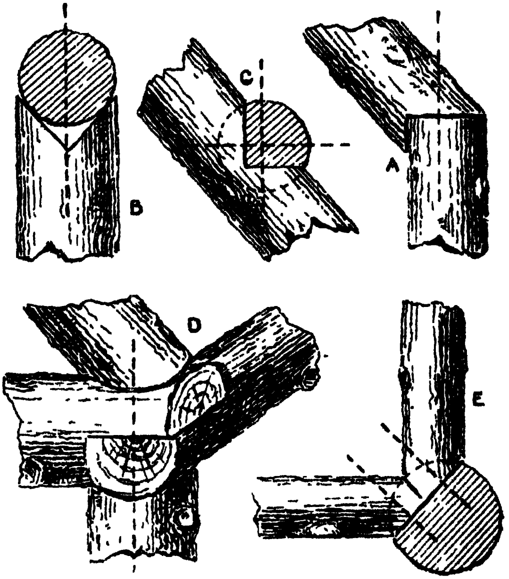


FIG. 303. Different Kinds of Joints used in Rustic Carpentry. A. Notched End of Rafter on Support. B. Wallplate on Transverse Rail resting on Notched Support. C. Rafter and Transverse Rail Notched to form Joint. D. Wallplates Notched and Halved to rest on Support with Rafter surmounting Joint. E. Ends of Rails meeting at Right Angles and entering Notch in Upright Dotted Lines show direction of Nails.

Joints in rustic carpentry.

Forms of garden arches.

549. With regard to other kinds of garden arches, it is well nigh needless to say that they may be made in a variety of ways and in a variety of form. The type of the garden arch has already been clearly indicated. Reduced to a minimum, it consists of two sides, from which

springs a top which spans a pathway below, the sides and top forming supports for climbing plants of all kinds, from the climbing rose to the convolvulus and everlasting pea, and plants of that sort. The uprights of the sides must be formed of posts of rough wood in its original state as it comes from the copse or hedge row in which it has been cut, or of sawn wood, such as quartering from the timber yard. Between the sides, or rather the similarly situated uprights of the sides, namely, those that are opposite each other, the framing of the head must intervene, and this framing may be semicircular or in the form of the pointed Gothic arch, or, if very wide, in the form of the depressed Tudor arch, which prevailed in houses that were built in the days of the monarchs of the Tudor times, and especially in the reign of Queen Elizabeth. These arches are easily made, if the instructions given above for the formation of the porch of the little greenhouse in the corner are carefully followed. Two frames, consisting of their uprights and the head that they support, and which spans the space below that is intercepted between them, are first prepared; and then these are connected by means of transverse rails notched into the frames from the outside if the frame be covered with wire netting, as a support for the climbers; and from the inside if a rebate is found all round the inner face of each piece of framework in which to lay trellis. If wire netting is used, it is a good plan to halve and notch the ends of the ends into the frame, leaving the shoulders of the other parts to go between the frames right up to the wire, which is then screwed to it by means of the wire staples used in bell-hanging to pin the bell wire to the walls. The wire may then be put on first without any trouble to the wood worker with regard to stretching; and when the transverse bars are knocked into place, it will be found that the outward pressure exerted by them against the frames strains and tightens the wire admirably. Or, instead of wire and trellis, wooden transverse bars of wood may be nailed to the framework at intervals of a few inches on either the outside or the inside, or on both, if preferred; or bars of strong iron wire may be driven in from one frame to the other, after the manner of bars to the doors of a rabbit hutch. Nothing more can be said on this part of the subject. The various forms of arches are shown in Fig. 304.

Tops of arches.

Forms of arches at top.

550. In cases in which the supports of the arch are carried up above the springing of the arched head, and indeed in all cases in which any little bit of addition in the way of ornament is required, it will best be found either in the shape of a little ornamental work within the inner surface of the arch itself, after the manner of the barge board in the gable end of a house;

Ornaments and finials in garden arches.

that is to say, in pierced work, which is generally the form it assumes, or some cut work, as indicated in A in Fig. 304 ; or in some kind of finial with which the top of the upright is capped. It would rather spoil the symmetry of the arched head if the supports were carried up close to the inner line of the arches shown in Fig. 304, as the amateur wood worker may readily see if he will take the trouble to draw the different forms given, and then prolong the supports in an upward direction. If the supports be carried up, it will be as well to make the head independently, and introduce it between the supports, letting it spring from brackets of an ornamental character attached to the inner sides of the uprights. With regard to finials, if the amateur wood worker can pick up some ends of curtain poles second-hand, he will find these come in very appropriately for the work ; but if not, he may easily make some for this purpose, or even cut the upper end of the support into a finial, as I will now show my readers.

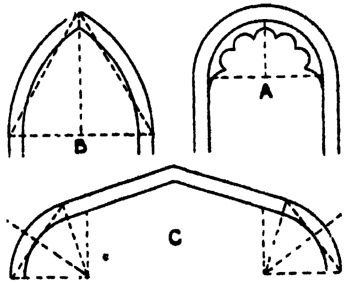


Fig. 304 Different Forms of Arches. A Semicircular Norman or Saxon Arch B Pointed Gothic Arch C Depressed Tudor Arch

Details of finial.

551. In Fig. 305, which, for the sake of clearness of detail, I have drawn on a scale of ¼ inch to 1 inch, showing division into inches by means of fine lines, let us suppose that the square end of the top of our upright is represented. Find c, the centre of the square end, draw straight lines crossing each other, so as to divide or bisect the edge of each face of the upright, and then, with the marking gauge set to 1 inch, draw a line c d, straight down the centre of each face, and then draw transverse lines across the face at intervals of 1 inch. This must be done on each of the four faces of the support or upright. Now, from a and b draw straight lines to c, or the line passing through c to the face of the upright, and with a tenon saw cut through the lines thus drawn on the faces. This will form a four-sided pyramidal point rising from a b. Next, make a saw-cut round the upright through e f, and then with the saw or a sharp chisel remove the wood between a b and g h in the manner shown in the illustration. Let an interval of ½ inch now occur, and along k l nail some

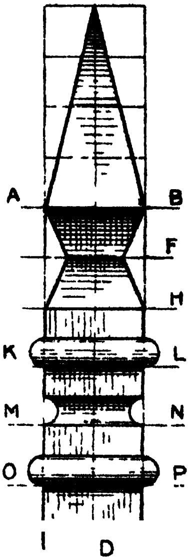


Fig 305 Example of Finial cut out with Saw, etc.

mopstick moulding, which will project just ½ inch beyond the faces of the upright. Let another interval of ½ inch occur, and then with a gouge take out a hollow all round the upright, as shown above M N, ½ inch deep. Then let another interval of ½ inch occur, and along and above O P nail another course of mopstick moulding. This will afford the semblance of an entablature on the top of the plain part of the upright. Nine inches will thus have been assigned to the finial, which looks fairly well when fashioned according to the instructions given. The finial will look all the better if a space of 6 inches is allowed to intervene between the springing of the arch and the entablature or imitation of an entablature on the line O P. I have said nothing about turned work, but any amateur wood worker who has a lathe will easily work out this finial in a round instead of a square form. This finial is given in its present form so that any home carpenter who likes to do so may shape it out for himself with simple tools with whose use he is familiar. If turned or cut independently of the support, the bottom of the finial should terminate in a peg or dowel, which must enter a hole of the same diameter, made with a centre bit in the top of the post.

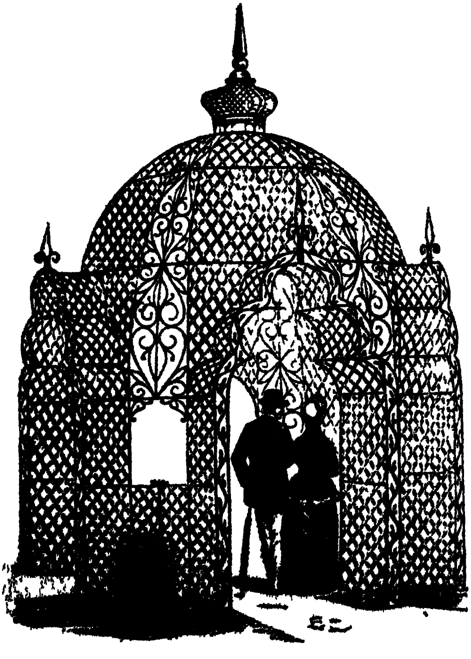


FIG. 306. Rose Temple in Wire Work.

552. I have said nothing about garden arches made in wire with iron rods as supports, because the home carpenter is not supposed to work in anything else but wood, and this is essentially a book on home carpentry. I will, however, add a few remarks on the construction of a "rose temple," as it is called, in wood; and to do this effectually, I must give a representation of this temple for roses made in wire, so that the amateur wood worker may better understand my description of its imitation in wood. This is shown in Fig. 306: the body below the dome is 8 feet in diameter, and the porches, or "annexes" as they are called, are 2 feet 6 inches deep. It is altogether a big affair, and costs a big price—only £45;

but that is a mere bagatelle to the millionaire, of course. Home carpenters are not millionaires: they are for the most part "pennyolaires," perhaps "shillingolaires," and have to go to work with caution. This is circular, but we must make ours octagonal in form, and on a smaller scale, constructing it in wood. I have indicated the plan of our rose temple in wood in Fig. 307, and I have made it 6 feet in diameter, and the porches or annexes 2 feet wide. It is large enough for display in the amateur wood worker's garden. I have made our porches 2 feet deep as well as 2 feet wide, so that our temple from entrance to entrance assumes the respectable width of 10 feet. First of all, make four porches, 2 feet square, with inside of arched top 6 feet 6 inches or 7 feet above the ground as preferred, and make them after the form and pattern of the porch to the small greenhouse in the corner, as illustrated previously in page 401. When made, connect these porches by transverse rails in the position of the lines B C, D E, F G, and H A, placing one at the bottom about 6 inches above the ground level, one at the top by the spring of the semicircular headings to the porches, and one in the middle. Nail a stout gravel board all round the bottom of the structure, attaching it to the lowest rails. Take care to carry the inner posts of the four porches upwards for some inches above the springing of the arched headings, so that the whole may be connected along the top by a continuous wallplate all round the octagon on one and the same level. This will serve as the foundation on which to plant the top. The connecting rails should be made of battens, 2 inches wide and 1 inch thick; the supports or uprights of quartering, 2 inches square. The wallplate should also be of quartering for strength's sake. Cover in the whole of the intervening spaces at B C, D E, F G, H A, and any space that may be unfilled above the heads of the porches with trellis work. Thus you will have the body of the temple easily completed, and now there is but to build the top on the body of the temple. Before this is done,

Rose temple in wire.

Rose temple in wood.

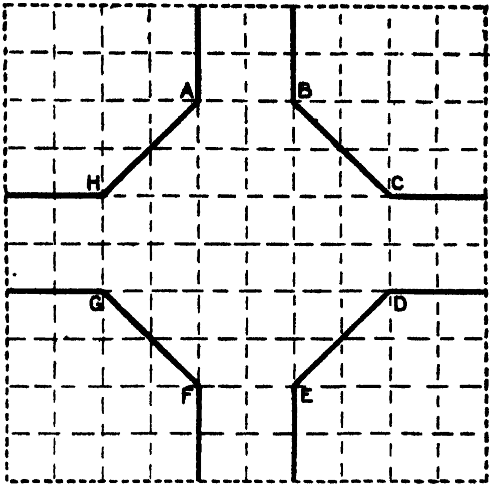


FIG. 307. Plan of Rose Temple in Wood Framing and Trellis Work.

it might be as well to nail a piece of ornamental cresting all round to the exterior of the wallplate to give an ornamental finish to this part of the work.

553. There are many ways of making the top of the temple, but perhaps the easiest way for the home carpenter will be to construct it of straight bars all abutting at the top against a common central octagonal block, which may be cut into the form of a finial at the top or finished with an entablature on which rest three or four successive blocks in the form of steps each smaller than the one below it. From this graduated top an iron wire should spire upwards, carrying the four cardinal points of the compass and a small vane. The rafters may be made of battens or quartering as preferred. They should be notched so as to rest on the wallplate below, and the finial itself should be mortised on each of its eight sides to receive tenons cut in the ends of the rafters. The intervals between the rafters, after having slips nailed to them to form rebates, may then be filled in with trellis work or with straight bars, nailed across at small intervals from rebate to rebate. If the amateur wood worker does not shrink from

Top of rose temple

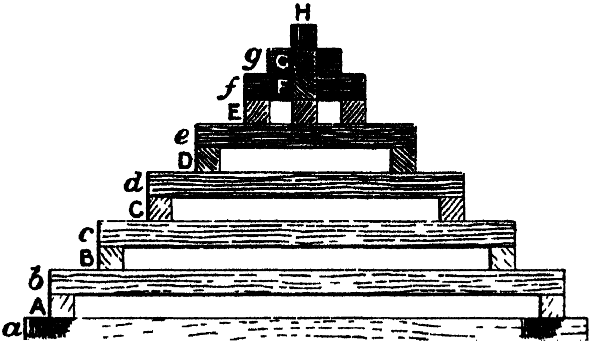


Fig. 308. Elevation of Square Pyramidal Top.

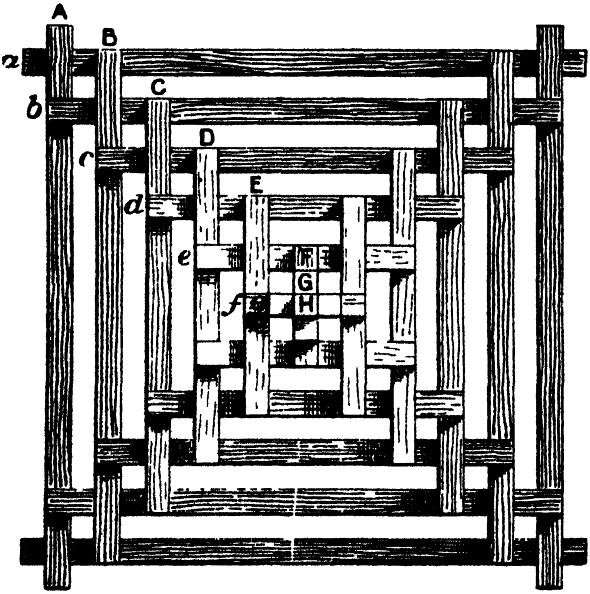


Fig 309 Plan of Square Pyramidal Top

the labour involved, the top may be formed in the shape of a dome by forming the rafters in the shape of quadrants or quarter of a circle, or in arcs of a larger circle. This may be easily done by building them of small pieces, cut and put together in the manner previously described for easily managing what is known as "circular work" in carpentry.

Construction of square pyramidal top.

554. But there is yet another way which may take the fancy of the home carpenter more than either of these; and this I will now describe, enunciating the principle by showing the home carpenter how to make a square pyramidal top to any square structure by placing bars one above another in pairs imposed at right angles on the pair immediately below them. Now, supposing that the wallplate of the structure coincided with the square defined by the bars *a*, A, the first bars that would be put on the wallplate would be the bar *a*, and the bar that corresponds to it on the opposite side. These bars project for, say, 1 inch beyond the wallplate, supposing the elevation and plan of the square pyramidal top shown in Figs. 308, 309, to be made of bars 1 inch square, the plan and elevation being both drawn to the scale of ⅛ inch, to 1 inch, or 1½ inches to 1 foot. On the bar *a* and its double, the bar A and its double are placed at right angles, and these also overlap the wallplate and the bar *a* and its counterpart to the extent of 1 inch. Next put on *b* and its counterpart, and then B and its counterpart, and work tier after tier in this way until you arrive at the central piece *f* F. Now, this forms a cross, and requires a little management in the making. First of all provide a bar or rail, which in this case would be 1 inch square and 5 inches in length, and let the ends be fixed to *e* and its counterpart, its upper surface will be found to be flush with E and its counterpart. Now make a cross of two pieces of 1 inch square rail, 5 inches in length. The two parts of this cross must be halved together, and then F will rest on and touch throughout its entire length on the rail placed midway between E and its counterpart, and the ends of *f* will rest on and be supported by the rails or bars just named. You have now got a solid cross at the top with its four arms flush, and on this you may, if you like, impose a second cross with parts 3 inches long, halved together in centre, and finish with a block 1 inch square on the centre of this cross. Drill a hole in this, and insert a piece of $\frac{3}{16}$ wire to carry small points of compass and arrow for vane. This modified form of top is shown in Fig. 310, in plan at A and elevation at B. In this *x* in the elevation shows the under and extra rail resting on *e*, *e'*, *f* and F, the arms of the cross halved together and resting, the rail F on and along *x* with

Construction of top.

which it is coterminous, the rails of which it is made being 5 inches long; *g* and G, the parts of the smaller cross 3 inches long, halved together and placed concentrically on and with the larger cross *f*, F, and H, the tiny block which crowns and caps the whole. The wire to carry vane is partly shown at K, fixed in a hole which is bored for its reception through H, G, and F. This should not be carried below F, but the point of the wire may be slightly pointed so that it may just enter *x* and catch the point in it.

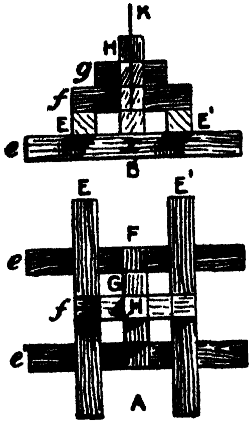


FIG. 310. Modified Top to Pyramidal Square in Plan (A), and Elevation (B).

Pyramidal top to rose temple.

555. The foregoing description of the construction of a square pyramidal top in the manner shown is intended to enunciate the principle which governs the making of all things of this kind, and by no means as a top of our rose temple; and, having arrived at a thorough comprehension of this, we shall be in a better position how to make open roofs of this kind for other places and in other forms on the same principle. The reader may probably urge that it has a dwarfed and squat appearance, and I must allow that it does so, and is in no way invested with that semi-steeple-like aspect which should characterise tops of this kind. Let us, however, first turn our attention to the completion of the top of the eight-sided rose temple in this manner. The width of the annexes or porches in our trellised rose temple was 2 feet, and the width of the openings between them would be about 2 feet 6 inches; so that the hexagon was not, strictly speaking, a regular or equilateral or equal-sided hexagon, although it might very easily be made so, and if this were done it would be found that the width of the porches would be very slightly increased. If the home carpenter wishes for an equal-sided hexagon he must make a working drawing to scale on paper accordingly, and regulate his work thereby. I have shown an equilateral octagon in Fig 311, and its outline is indicated by the dotted lines and the portions of the solid lines intercepted between their points. I spoke of putting a cresting round the wallplate of the rose temple. This may

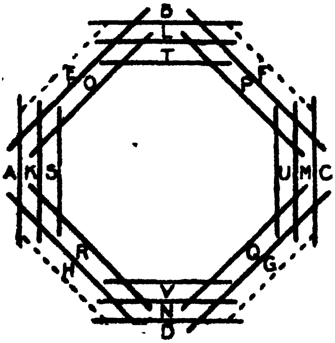


FIG. 311. Pyramidal Roof for Rose Temple.

be nailed to the edge of the wallplate itself, but it would look better if blocks were attached to the edge of the wallplate so as to move the cresting to the front about 1 or 2 inches from it, and this would allow the long shoots of the climbing roses to make their way under and between it and the wallplate, in some places to ramble over the top. It would just make a little difference in the length of the rails first placed on the substructure to form the roof, but this would not make much difference.

Cresting to wallplate of rose temple.

556. Now, it does not matter whether the first bars of the roof are laid on over the porches or the spaces between them, so we will suppose them to have been laid on the wallplate immediately behind the porches and over them; and in this case the ends of the bars will butt against the cresting. Fig. 311 is drawn on the supposition that there is no cresting at all, and we will take it that in the diagram before us, A, B, C, and D represent the position of the porches, and the first set of rails laid over them on the wallplate itself. Going on another step in advance, E, F, G, and H will be the next series of ends laid, and the ends of these will rest on and slightly overlap A, B, C, and D. These will be over and parallel with the spaces. The next series of bars will be K, L, M and N; these will be parallel with the annexes, and their ends will slightly overlap and rest on the rails E, F, G, and H. The next and fourth series of bars will be O, P, Q, and R, and the ends of these will rest on and overlap the rails K, L, M, and N; these will be parallel to the sides or spaces between the annexes. The fifth series of bars will be S, T, U, and V, which in their turn will be parallel to the porches, and overlap and rest on the rails O, P, Q, R; and thus the work of building tier above tier until the whole space has been covered in, and the top finished off in the same way as the square pyramidal top, only that the work will be slightly modified by the constructional circumstances attending the octagonal pyramidal form.

Formation of octagonal pyramidal top.

557. So far so good; but how, some of my readers will ask, do you propose to give to the covering in of such structures as the rose temple the steeple-like form you have mentioned? Simply by using boards or frames instead of square rails; that is to say, by giving height to the rails. We have been taking these at 1 inch square in section. Now, it is evident that if our rails were 2 inches high instead of 1 inch, the height of the top would be doubled; if 3 inches high it would be trebled; if 4 inches it would be four times as high, and so on. Theoretically, this would be so; but in the case of boards it would not be so, as height would be lost in some degree by jointing the boards together by notching. It would be so,

Increase of height of top.

however, practically, if the boards were fixed together by means of blocks screwed on from within in the form of slips put in the angles of the boards where they cross, or if a series of frames were used, which could be screwed together at the crossing and overlapping. All this would necessarily involve much labour; but labour or work followed up from time to time and with steady persistence conquers all things, and the end comes at last, although it be long waited for and long in coming.

Pyramidal top formed by boards.

538. I will now endeavour to give my readers the best examples I can of the formation of pyramidal tops by boards and frames; and first let me deal with the formation by boards, as shown in Fig. 312. I have judged it best to do this by representing the appearance of one corner of the commencement of a pyramidal top of boards. In this A is the lowest board, and forms the lowest member of the top, and is placed on the wallplate, to which it is firmly and suitably secured. The board B, which forms with A the lowest square of the pyramidal top of the boards, is notched on to A. There are three modes of doing this: a notch may be cut wholly in A into which B is dropped, or it may be cut wholly in B, so that the edge of A fits up and into it; thirdly, which to my mind is the best way of the three, halving may be resorted to, and a notch of half the depth of those made under the other methods be made in each. By this means, each board is kept in place, and restrained from shifting in any way by the shoulders formed by the mode of notching adopted. Passing on to C, the corner of this is dropped into a notch formed wholly in B. The board C forms the lowest board of the second square in this corner, and D the upper board which is halved at the jointure into C, and C into D in the same manner as A and B were connected. The boards may be further secured by hidden dowels, formed of wire nails fixed first of all in

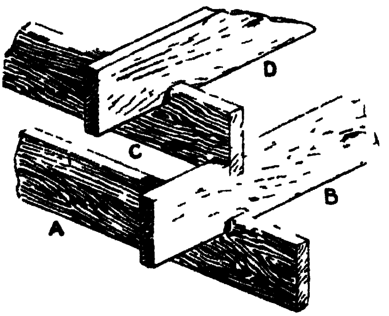


FIG 312 Corner of Pyramidal Top formed by Boards, showing Jointing.

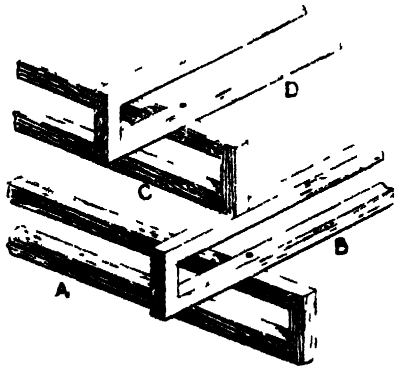


FIG. 313. Corner of Pyramidal Top formed by Frames, showing Jointing by Screws.

the centre of the notch in the lower board, and B is then driven down and entered by the opposing point of the upright rail. Additional strength may be given to the connection of the boards by a block about 1 inch square at each corner, screwed vertically into the boards, and extending from the lower edge of the lower board to the upper edge of the board above it. The method of forming the top for a square pyramidal form holds good for every form, whether hexagonal or octagonal; but the angle of crossing and of jointure will, of course, vary in each case.

Platform in corner of garden

Construction of platform.

559. Thus much for the formation of pyramidal roofing or *quasi* roofing, as I should rather call it, for it is in no way impervious to the weather. For small work, another form may be used with excellent effect. In one corner of a garden of mine a wall about 5 feet in height ran along one side, and met another wall 6 feet 6 inches or more in height, which formed my boundary at the bottom. Both walls belonged to me, and I therefore possessed the right of putting anything on the top of them, and on the outer edge, and I could prevent any one else doing the same kind of thing, which I did, much to the disgust of the dweller beyond and "over the garden wall". By the way, I have mentioned one of these walls before in describing some specialities in wall gardening, and I may say that it was in connection with the otherwise excessively plain piece of work shown in Fig. 314 that I made my first essay in notched work which I have already described in detail. The home carpenter will notice that some boarded work surmounts the outer edge of the wall to the right, carried upwards by means of a ramp to a height sufficient to meet a similar piece of boarded work carried along the outer edge of the higher wall at the bottom for the distance of about 30 inches. This was returned by a piece closed in at the end, the outer upright of which was carried downward for some distance, and nailed securely to plugs driven into the wall. This was used as the inner upright of a rough bracket, formed by two pieces at right angles to the long upright halved into a shorter upright

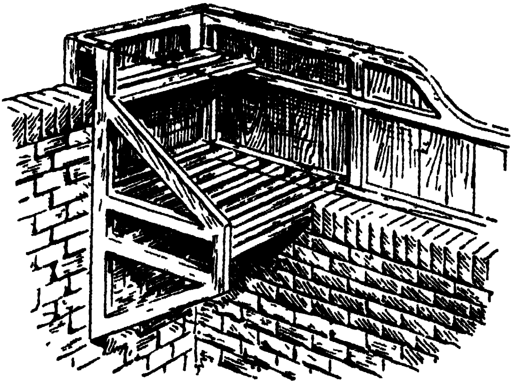


Fig. 314 Platform for Plants in Corner of Garden.

piece in front, and to these were affixed two diagonal pieces as shown, one slanting upwards and the other downwards, the whole forming a bracket which supported the outer ends of rails resting on a rail nailed horizontally to the topmost rail, and forming a rebate to receive them. The other ends rested on the wall, and were fastened to the lower rail of the boarded work as shown. In front was the notched composite bar, to which allusion has been already made. The railing thus formed constituted a convenient platform upon which to place a few choice plants in pots. About halfway up, a very narrow shelf was put across for some other plants. On looking at my sketch, I find it more than halfway up, for it rested on the top of the higher wall, and only projected about 2 inches beyond it; but as the framing was made of quartering 2 inches square, on the outside of which were nailed boards 1 inch thick, this gave a width of 8 inches to the shelf, of which 6 rested on the wall, and 2, as I have said, projected beyond it. This shelf is duly shown in Fig. 314.

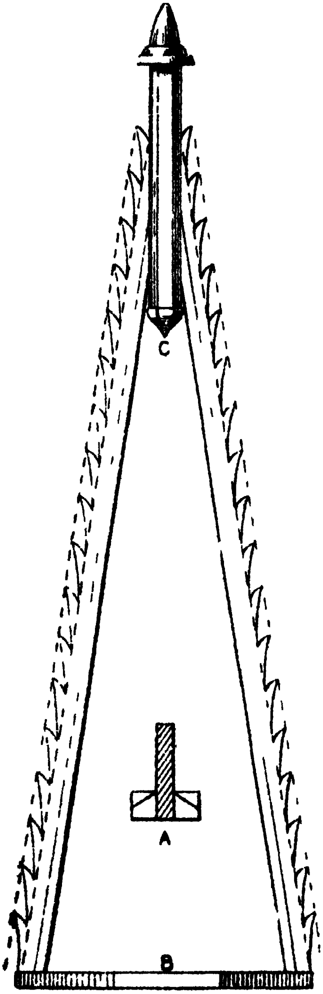


FIG. 315. Pyramidal Cap in form of Miniature Spire

560. Now to my mind, although I dare say many of my readers will be satisfied with the platform and shelf as shown in Fig. 314, it is scarcely ornamental enough to be attractive in itself. When the plants were in position, however, one looked rather at them than at the structure on which they rested, and so the general effect was sufficiently good to allow the whole affair to pass muster. But I *intended* to have added something more, but what with want of time and one hindrance and another my intending never got beyond intention.

Good intentions

561. Well, in Fig. 315, the reader will find a pictorial representation of my good intention, and an embodiment of the idea that traced its parentage to the sources already indicated. It was to cap and crown the platform with

a pyramidal superstructure in the form of a miniature spire; and very pretty it would have looked. First of all, I should have put a stoutly made square frame on the top of the wood work as indicated by the dotted lines in Fig. 314, at the top of the illustration. The front part of this frame is shown in Fig. 316 at A. In this frame I should have taken eight points to indicate the eight angles of a regular octagon, and at these points I should have cut eight mortices to receive as many uprights as shown at B and C. These uprights would have been tenoned into and supported an octagonal frame, as shown at F. To the intermediate spaces I should have nailed triangular boards, 1 inch thick, the broad top notched into and nailed against the octagonal framing, and the narrow point nailed on to the angle of the square frame immediately below it. Then from the octagonal framing indicated at F would have risen the spire whose construction is indicated with sufficient clearness to be intelligible in Fig. 315.

Miniature spire.

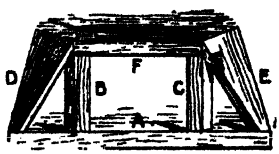


Fig. 816. Support for Base of Pyramidal Spire.

Support for spire.

562. But the construction of this spire will require particular notice. The ribs should be formed of eight pieces of board, about 1 inch thick and 4 inches wide, as roughly shown in section at A in Fig 315. Along the inner edges of these boards, and on both sides slips 1 inch square should be nailed, and the upper outer edges of these slips should be bevelled, as also shown in section at A. The object in doing this is to form a rebate in which to nail the ends of transverse bars 1 inch in width and ½ inch thick, to be carried upwards on all sides as far as it is practicable to do so, after these boards, which define and regulate the shape of the spire, have been placed in position. The home carpenter may try trellis if he likes; but the space is so narrow, even at the bottom, that I fear he will make a mess of it, and find it better after all to stick to the bars.

Construction of spire and ribs.

563. There will still be 3 inches of each of the eight ribs left to be dealt with, and a line 1¼ inches or thereabouts from the outer edge on each side marked with a marking gauge or ruled with straight-edge and pencil, and this space divided and cut into *quasi* crockets, as shown in the two opposite ribs delineated in Fig. 315. These may be slightly bevelled on each side, if the amateur wood worker prefers to do so, to lessen the labour of cutting the crockets; but I think myself that the ribs had better retain their original thickness throughout. When the eight ribs are ready, they must be suitably connected with the frame at base. Perhaps the best way will be to put screws through the octagonal frame below, and let the points

of these enter as deeply as may be into the ends of the ribs. Then put slips of wood of suitable shape and size on the framing B, butting tightly against the sides of the ribs, the rebate having been cut away a little to receive them, and then to skew-nail the ends of these to the ribs themselves. At the top, an octagonal piece of wood must be provided, finished at the top and bottom as shown at C in Fig. 315, or in any other suitable manner that may suggest itself to the amateur. The tops of the rails must then be cut in such a way that each rib may rest against one side of the centre post. The slips forming the rebates for the bars will have to be cut to admit of every part fitting singly together; and as I have advised the home carpenter to leave the ribs of their original thickness, there will be no difficulty in nailing the upper ends through the crockets to the central post. I feel sure that the home carpenter will be pleased with this, if he makes one. I am almost tempted to regret that I have no spare time now to make one for myself. At the outer corner of the square indicated by the dotted lines in Fig. 316, on which it is proposed to raise the superstructure just described, may be appropriately finished by attaching to the under part a pendant similar in general form and appearance to the turned end of a curtain pole. Indeed, one of these will do very well, and it will, in all probability, have a double screw in it; that is to say, a screw cut both ways, by which it may be fastened to the wood work above.

Connection of ribs with framing and top.

564. There is not much to be said about pergolas, which are chiefly to be found in Italian gardens, in which they assume a very massive form. The pergola, Worcester tells us, in his admirable Dictionary of the English Language, is "a kind of booth or small house, which afforded scarcely any protection except by its roof, so that passers-by could easily look into it"; and then he goes on to tell us that Brande says: "It is used by planters to signify a balcony on the outside of a house. By Winckelmann, it is thought to have been an arbour or a terrace overhanging an arbour." These definitions are all very well as far as they go, and may do well enough as a description of what the old Roman classic writers meant by a pergola; but they give you the idea of a roof impervious to the weather, whereas the roof or *quasi* roof of the pergola is nothing of the kind. In Italian gardens the pergola is usually formed by a wall at the back, either a wall in itself or the wall of some building, which is usually clad with creepers and climbers. At some distance from the wall, in many cases several feet from it, a series of massive posts are planted, either of wood or stone; and on the top of these pillars or posts is placed a continuous architrave or

The pergola.

Its general character.

lintel of thick beams. From the wall to this architrave smaller transverse pieces of wood, fairly substantial in themselves, are placed at intervals, and on these are laid other poles parallel to the wall and architrave and between them. Thus a rough but open framing is made, over which the climbers may roam as they will, forming a sort of roof which is certainly not impervious to rain, but which from its great breadth affords when covered in a pleasant retreat from the fierce radiance of the midday sun in Southern climes, a fitting place in which to enjoy pacing up and down from end to end with a congenial friend, or an hour's lounge on a comfortable garden couch.

Construction of the pergola.

565. After the description of the Italian pergola given above it will be seen at once that in English gardens their construction will be easy enough, and based on the rough and ready principle. Given a few poles of all sizes, and the materials are ready at hand. With us the pergola may assume the form of a covered way in front of a wall, after the Italian fashion, or an arcade. No illustration is needed; for my verbal instructions will, I think, be sufficient to make its construction clear enough to all. If we have a garden wall covered with Virginian creeper, Japanese honeysuckle, jasmines or jessamines white and sweet-scented, and yellow without scent, woodbines of the ordinary kind, clematis, climbing roses and other plants of this sort, all we have to do is to plant a series of the thicker poles, say poles of larch or fir, at equal distances from each other and at a suitable distance from the wall, fixing them firmly in the ground by removing the soil, or, in other words, by making holes in it, putting in each post one after another and filling up with brickbats, stones and earth, and ramming the whole closely and firmly togther. Then cut the tops of the poles off, either at a height above that of the wall, or of the same height or a little lower, the object being to suit the height of the posts to the manner in which the architrave is to be put on, so that when it is put on its upper surface may be level with the top of the wall. Thus, if the posts are of sufficient diameter to be notched as shown in rustic carpentry, to receive the architrave they must be lower. If they are to be notched vertically, either in front or behind, or, in other words, halved, to receive the architrave similarly notched, they must be cut to the same height as the wall; but if the architrave is to be bound to it,—a clumsy mode of procedure, which I do not recommend,—the pole must be cut off higher than the wall. And they must be treated in this way, if the architrave is to be formed by simply nailing a rail to it at the height of the wall,—a mode which is devoid of stability, as in all cases two *round* surfaces are nailed together, which implies weakness of construction.

The framing of the roof then consists in laying sticks either from the wall to the architrave at right angles to these, and crossing them lengthwise with others, or diagonally each way after the manner of trellis work. The width of the pergola will depend upon circumstances. Thus, if the creepers find rootage in a narrow border, say 2 feet in width with a grass plot 1 foot in width along its edge, and a path, say 4 feet wide, intervenes between the edging of the border and the margin of a grass lawn in which the posts are set, the width of the pergola including the posts will be about 7 feet 6 inches.

The pergola as an arcade.

566. But suppose we are going to make an arcade—a pleached alley—of our pergola, that is to say, a covered way over a walk, with the means of growing climbers on each side of it, let us put in our posts in pairs about 18 inches apart, and with a distance of some 6 or 8 feet between the pairs, and then put up an architrave on the post lengthwise from end to end, binding them all securely together. Across from architrave to architrave then lay poles of suitable diameter, projecting for about 6 inches beyond the architraves on each side, and about the same distance apart, and nail them firmly to the poles. I have said that no illustration of the Italian form of pergola is needed, and I may go even further and say that no diagram of a formal character exhibiting the front elevation, end elevation, plan and roof plan of a pergola is requisite; but when I remember how many there are who fail to realise mentally or to see in what is termed "the mind's eye" from a verbal description, how a piece of constructive work would look when it is put together in the position which it is to occupy, I have given in Fig. 317 a sketch view of what I have ventured to call a *suggestion* for an English pergola. It has the semblance of an arcade, but it is a pergola or pergula as well, for the word when traced to its source, which is found in the Latin *pergo*, "I go on, or run on," is found to imply continuity, and in this we certainly possess the chief requisite and characteristic,--continuity of structure. The formation which I have shown in Fig. 317 may be turned to good account for many purposes It will do for a pergola in its primitive Italian form, backed by a wall; it will do, as I have said, as an arcaded or covered way with a walk below; and with a sloping roof it will further serve as a model for a rustic verandah, and by a roof I mean a covering that is impervious to rain, but which is formed of some light and easily worked material, such, for instance, as Willesden paper. In the illustration the spaces between the pairs of uprights is shown filled with a rough trellis work, a rail is nailed to the uprights themselves about 12 inches or more if the pergola be long enough to admit of it, below the architrave, the wider spaces

between the poles is spanned by a depressed arching also formed by poles, and vertical bars are placed at intervals on the arches thus formed, the whole affording an easy means of support for climbing plants of all kinds, and the means also of diverting the course of the stems and branchlets to right and left, so that they may be bent over the roofing at any and every point and ultimately over it

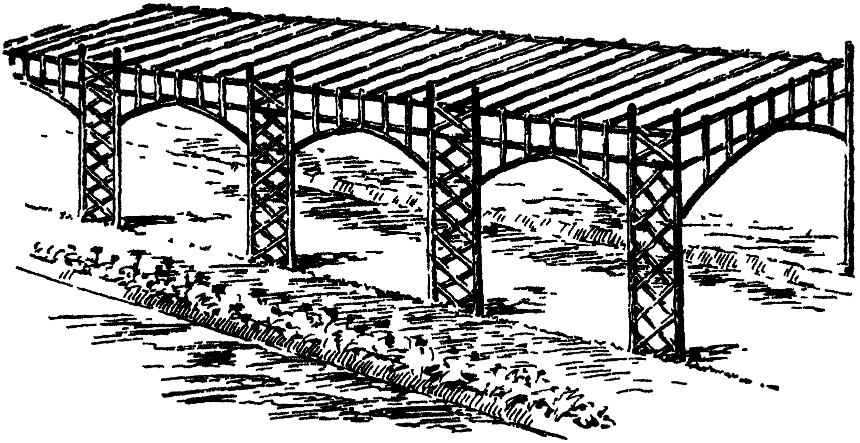


FIG 317 A Suggestion for an English Pergola

567. I am afraid I have been betrayed into lingering far too long a time on the pergola, so I will proceed at once to a consideration of garden steps and garden bridges. It happens sometimes in gardens that there is a somewhat abrupt descent from a higher to a lower level, mostly the outcome of mere accident. For example, a grass lawn may be on a higher level than some garden ground that lies beyond it, or an opening may have been cut through a hedge to give access to the ground—no matter to what purpose it may be devoted - on the other side of the hedge; and a difference in level leads to the formation of a steep incline, or, if not absolutely steep, sufficiently on a slope to carry one down with a run. Suppose, for instance, that the difference in level is from 9 to 12 inches, and the slope that has been made for transit from one level to another is but a yard in length, the distance is nothing in itself, but the gradient is steep and abrupt, ranging, according to our difference of level, from 9 to 12 inches in 36 inches, or, in other words, from 1 in 4 to 1 in 3. Whenever I have found this to be the case, I have formed the descent into steps, having two for lesser heights and three for greater heights: thus there may be two steps or three steps in which the width of the step and the height of the riser will differ

Inclines in garden ground.

according to circumstances. It is, however, with the formation of the steps that we are chiefly concerned, and to that we must turn our attention.

Forming slope for steps

568. Now I think it will be sufficiently plain to the dullest comprehension, that steps formed of any kind of soil, owing to the want of cohesion in the particles of which it is formed, would not retain its form in their original shape for any time at all when subjected to constant traffic, and that this would be found to be the case even if the steps were turfed over. Hence it is that when steps are required in a garden they are usually formed of brick or stone, even if there be but one. The home carpenter, however, will seek to form his steps of wood; and we must see how this may be done. He must not make them of plain wood, after the manner of stairs in a house; for steps thus made would soon yield to the influence of the weather, and be dangerous and slippery in times of wet and frost. When possible, I have cut the slope first of all with the spade into the requisite number of steps, and then put curbs in front of them after the manner of risers, and over the steps I have generally made a garden arch. I have then taken advantage of the poles or supports of which the arch is formed, as uprights to which to nail my containing curbs. Thus supposing A B to represent a height of 1 foot, and B H a length of 3 feet; A H being the slope that it is desired to graduate or form into steps, from the higher level shown by G A to the lower level shown by B H, we may form steps by cutting away H F M, M S L, L K A, in the slope, if three are required, or if two are required by cutting away H P O, O N A. In one case containing curbs will be required at A K, L S, and M F, and in the other at O P, and A N. Similarly, containing curbs placed at Q H, R M, and C L, and the hollows H Q M, M R L, L C A, filled with earth, and closely rammed to give as much solidity to the steps as possible. I prefer cutting away the earth myself, but the home carpenter must be guided by circumstances. All I have to do is to show him how to make what I call the containing curb.

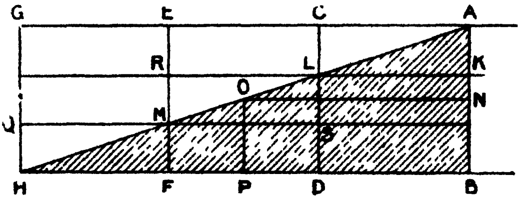


FIG. 318 Graduation of Slope for Steps

569. If we are dealing with a case in which a garden arch spans the steps, and the arch is similar to the Japanesque arch already described, poles will be driven in at A B, C D, E F, and G H, and we shall want curbs at M F,

Containing curbs for steps.

Construction of containing curb.

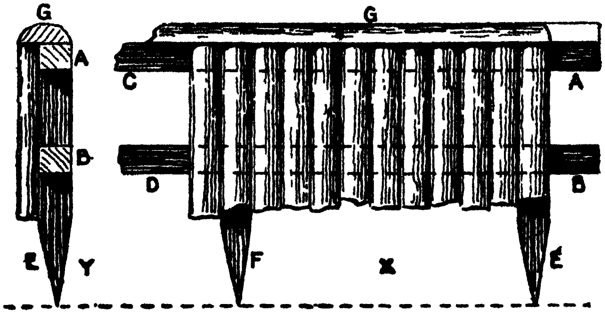


FIG. 319 Construction of Containing Curb for Steps shown in Front Elevation (X), and Section (Y)

L S, and A K. If there is no arch, a frame on each side will be needful, or an equivalent to a frame to which to nail the containing curbs; but I will make reference to this presently. To make a containing curb such as would be suitable for attachment to poles or any vertical supports of that nature, we shall require two rails of stout stuff from 1½ inches to 2 inches square, as shown at A and B, and some short pieces of the same kind, sharpened at the lower end, say three or at the utmost four, if the containing curb be 3 feet or more in length between the . These rails and uprights *may* be halved together, as shown as far as it can be in section at Y in Fig 319; or, if it be preferred, the rails may be nailed on to the outer face of the uprights, or, better, secured with long screws, the heads of which should be deeply countersunk into the rails. I do not like this plan myself, but in order to prevent weakening either rail or upright more than it can be helped, a compromise may be effected by notching each to one-fourth their thickness, and thus effecting what may be termed "quarter-notching," halving from this point of view finding an equivalent name in "semi-notching". When this frame has been made—and any rough stuff will do for it, as it will be out of sight when the steps are finished—some ends of poles, whose tops may have been used for other purposes, should be sawn in half longitudinally, after the manner described in making rustic mosaic work. As long as the tops of these are trimmed square, and any projecting pieces at the sides taken off with a sharp chisel, so that the pieces fit as closely together as possible when nailed with stout wire nails to the front of the rails, equality in length does not matter in any way. The only requisite as to length is that they shall be two or three inches below the rail B, so that the turf or any material that is used to form the surface of the step below may be brought against the containing curb to such a level as may be found necessary. Along the top of the rail A, a piece of pole, about 2 inches or a little more in diameter, should be nailed to form an edge to the step; this should lap over the tops of the pieces along the front. The horns shown at A and B, and the horns similarly formed at the other end of the curb—for a portion only of the curb is shown in the diagram—should be brought into position *behind* the opposite poles, between which the curb is placed, and firmly nailed to them. The head of each step should be formed of turf, if the descent is from grass to grass; but if from grass to gravel, or any other material used in forming paths, or *vice versâ*, it should be of this material. It would be a good plan to form the tread by a thick coating of tarred shingle or coarse gravel mixed with tar, in which a little pitch has been boiled to give consistency to the mass, the surface being subsequently tarred and thickly sprinkled with fine gravel.

Steps without side supports.

570. When there are no side supports it will be better to cut out the whole of the soil in A B H; and then to put in a framing consisting of two side pieces, which assume the form shown by the three steps A C L, L K M, and M Q H, connected by cross rails. The amateur wood worker, I am sure, does not require to be told how to make such a piece of framing. Proceed, then, to nail pieces of pole sawn in half lengthwise to the front and sides of the steps, putting a piece of pole round the edge and at the sides, after the manner shown in Fig. 319. When the frame has been firmly fixed in the ground, the steps may be made by filling up each opening with broken pieces of brick rubbish, coarse shingle, and coarse gravel, all mixed with soil and well rammed together until the surface is reached. This may be formed as already shown above, and the slope on either side may then be firmly pressed against the side of the steps. When finished, they will assume the appearance shown in Fig. 320. The only question is whether or not the home carpenter will think it necessary to make a hand rail on either side. If so, he may easily do this by carrying the uprights used in making the framing of the steps to the height deemed necessary, and connecting them with a hand rail parallel to the slope. The uprights and hand rail may be covered with sawn rods carried vertically up the sides of the former, and longitudinally along the hand rail. Other forms will doubtless suggest themselves to the home carpenter.

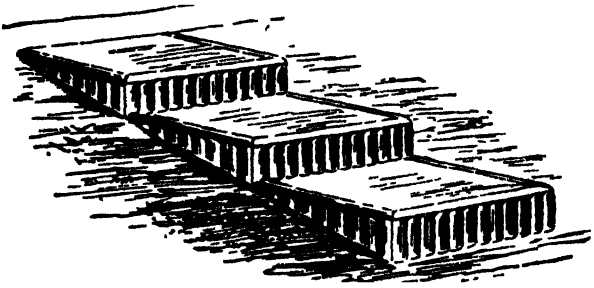


FIG. 320. Garden Steps formed in Sloping Descent

571. From steps to bridges the transition is gradual but easy; for what I am now going to describe forms, as it were, a connecting link between the two. It often happens that in order to make a short cut, and save, perhaps, a little bit of walking, instead of taking a legitimate path or route, men, women, and children will ruthlessly tramp across a border that fringes a lawn to get as quickly as they can to the other side. Sometimes I have tried to save my border or borders by setting large flat stones at intervals of 12 or 15 inches to serve as stepping stones; but this has not altogether had the desired effect, so I have made little bridges which have served the purpose better. Of course, these may be made in any form of home carpentry, either in rustic work of rough poles with uprights fixed in the soil, or, it may be, made of quartering duly framed together. I think the better plan will be to show the side elevation of a step-bridge of this kind, framed together with quartering, which will afford the home carpenter the keynote to the construction of things of this kind in this or any other mode of carpentry that he may desire to adopt. I will first deal with a case in which the lawn was considerably higher than a border of considerable length which flanked it. It was a lawn at the back of a house in which I once lived; it had been made, and very badly made too, for, being very much sloped and abruptly rounded at the edges as shown in Fig. 321, it had, as I used to say, all the appearance of a big green feather bed. Part of the edge of this lawn is shown in section at A in Fig. 321. In making all step-bridges, the rails should be connected by transverse pieces notched or mortised into them. These are not shown in Figs. 321, 322; but there should be at least three cross pieces, one in the middle, and one at each end or near such end; and, preferably, these transverse ties should come, if possible, each under a batten.

Step bridge across path.

572. Now, my readers must kindly bear in mind that it is with principles of construction only that I am dealing with at present. Dimensions are out of the question altogether, for the home carpenter must regulate and fix these according to circumstances. As for materials for small step-bridges across borders, etc., quartering 2 inches square and battens 2 inches by 1 inch, the former for the framing, and the latter for the footway, are all that are required, excepting always some long stout screws and some wire nails about $3\frac{1}{2}$ inches long that are equally strong and stout; and this is all I need say on this score. Now, to form the bridge shown in Fig. 321, four uprights are required, two short and two long; further, two long pieces and one short piece are re-

Principles, dimensions, and materials.

Parts of step-bridge and construction.

quired as rails, and three pieces to be used as diagonals. This step-bridge is intended to be removable; but in order to steady it and in some measure to prevent dislodgement, the uprights should be sharpened at the bottom and allowed to enter the ground. If they can be furnished with metal shoes—and the amateur can make these himself of zinc, tinplate, or thin sheet iron—so much the better. It will be better and stronger to connect the standards A, B, C, D, and the rails E, F, G, by quarter-notching, screwing them firmly together, and the diagonal H, which acts as a tie and a brace, will have to be let into the uprights A and B in the same manner. The diagonals K L will butt against the rail F without notching, but these pieces must be shouldered within, so as to butt against the upright C to the full extent to which they will go, and the ends cut and brought close together as shown in the illustration. The standard might be very slightly notched at this point, so that the ends may find some little lodgment. The pathway itself will be formed of battens put on transversely from rail to rail as shown. The battens should project slightly, say 2 inches beyond the face of the rails. The upper rail E may, if preferred, be carried high enough to make a hand rail, but it may be left dwarf as shown in the illustration. The intervening spaces which I have left open may be filled with trellis work, if preferred, or by railing formed of mopstick put in vertically; but the mode and manner of doing this must be left for another part of this volume. The home carpenter must not omit to place strong diagonal braces halved into each other at the centre between the standards B and C and their opposites, cutting the ends full and accurately, so as to butt against the inner

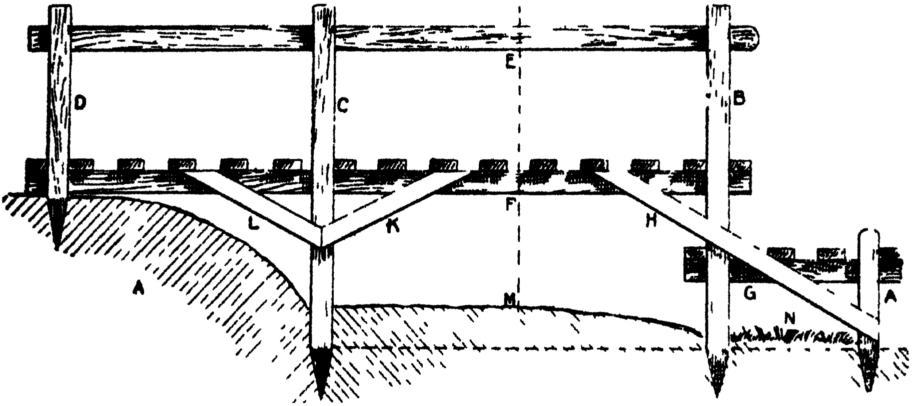


FIG. 321. Side Elevation of Small Step-Bridge across Border from Lawn to Path

faces of the uprights to which they must be securely screwed or nailed. It will be noticed that the main part of the step-bridge over the border M runs on and rests on the lawn A. The step at O just spans and protects the grass verge N, which in my case was 12 inches in breadth. The ends of the pieces project one beyond the other at the crossings and jointings in the form of horns. The arrises of these ends should be rounded off to prevent any chance of injury from the edges if left sharp and square.

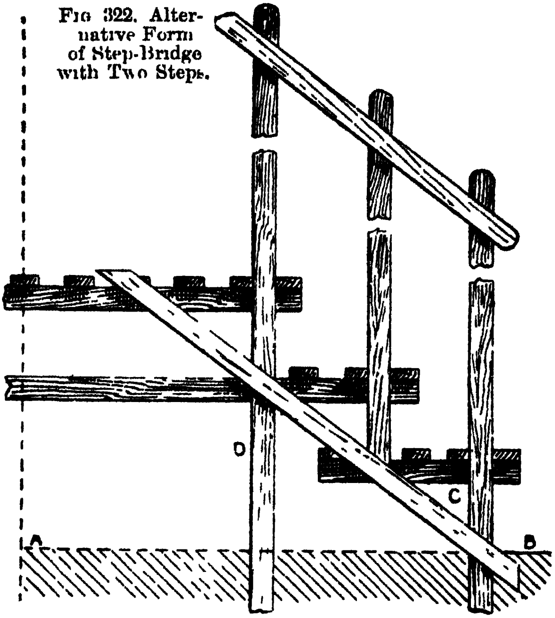


FIG 322. Alternative Form of Step-Bridge with Two Steps.

573. In Fig. 322 an alternative form of step-bridge is shown, which is better calculated to be a permanent structure, and accordingly the uprights are shown as entering the earth, the level of which is shown by the dotted line A B. In this the principle and method of construction are precisely the same as for the step-bridge previously described, so I need not go through it all again. The uprights may be carried up to a sufficient height to form a good hand rail at the top. The step C may be carried forward about 2 inches to the right with advantage, so as to give a wider tread. This is done by giving more length to the rail sufficient to admit of the addition of another batten in front. With the instructions now before him, the home carpenter will be able, or, at all events, ought to be able, to make any kind of steps or step-bridge without trouble. He must not forget to put in the diagonal braces transversely between the upright D, and its counterpart on the opposite side.

Alternative form of step-bridge.

574. The transition from step-bridges to bridges is easy and natural. The form of bridge requisite to afford the means of crossing a dyke is shown in Fig. 321, with this alteration only, namely, that the opposite side to the right would be the same as that to the left, so that the ends might rest

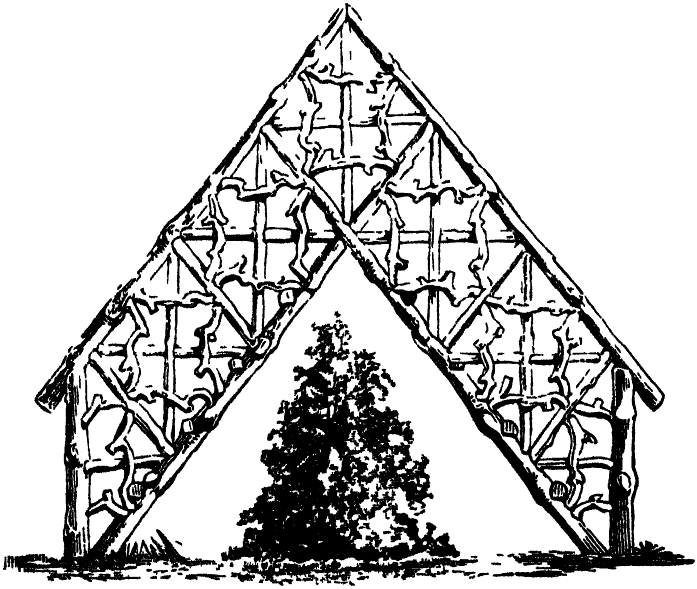
Bridge over dyke.

fairly and squarely on opposite banks, as the bank on the opposite side would be similar to the bank A, while the border M would represent the water in the dyke. In point of fact, the half to the right of the central dotted line would be similar in every respect to the half to the left. In like manner, if the surface at A was on the same level as that at N, the half of the step-bridge would be the same to the left of the central dotted line as that now shown to the right, and it would have a step similar to that at G on the left-hand side as well as on the right. Only half of the step-bridge shown in Fig. 322 has been given, as it was useless to waste space by giving the whole of the diagram. The only thing for the home carpenter to bear in mind in making a bridge over a dyke is that as the span will undoubtedly be much wider than that of a border, the timber used must be larger than ordinary quartering say 3 inches by 2 inches, or 3 inches by 3 inches, or even 4 inches by 3 inches, according to the width of the dyke; and it must be remembered that the beams which carry the transverse bars must be laid after the manner of joists; that is to say, with the depth vertically. The side rails, moreover, must be framed together, as directed for step-bridges at the close of section 571. By this means a strong platform for the footway is obtained. In making all step-bridges the rails should be connected by transverse pieces notched or mortised into them. These are not shown in Figs. 321, 322; but there should be at least three cross pieces, one in the middle and one at each end, or near each end, and, preferably, these transverse ties should come, if possible, each under a batten.

Bridge over roadway, etc.

575. Men, it has been said, are merely children of a larger growth; and this is the case with bridges over roadways when compared with the smaller kinds of bridges of which I have been treating. There is not much to be said about them. The mode of making them is practically the same, but all the posts and rails and braces must be on a larger scale, and therefore far more massive and stronger. The main posts at the four corners of the highest part the platform that is thrown across a cartway, say 8 or 10 feet wide with quickset hedges on either side—must be trees of larch or fir, strongly imbedded in the soil in close contiguity to the inner or field sides of the hedge. The style of carpentry employed must be that of rustic carpentry; for rounded surfaces will have to be notched and applied to one another, and pinned together with oaken pins driven through holes bored with a twistbit of large calibre, or with great spike nails that will require a hammer far heavier than that usually wielded by the amateur to drive them home to the head. The rails must be as substantial as the posts,

and the whole structure must be braced and strengthened by diagonal braces, and the braces transversely between the posts must not be omitted. A strong and reliable hand rail well fenced from end to end must be provided, to obviate all chance of any child who may cross over it stepping through. The height of the level platform must be determined by the builder of the bridge to suit his own requirements, but certainly it should be high enough to admit of the passage under it of a man on horseback. As for the approaches—the incline by which the central part is reached—these should be equally stout and strong, and the ascent should be made by broad steps, and not by narrow bars after the fashion of a ladder. None but foot passengers will cross the bridge - no carriage, not even a carriage with one wheel, a wheelbarrow so a width varying from 3 to 4 feet will be sufficient. It may be made ornamental by climbers and trailers, and notably by Irish ivy, which may soon be made to cover it, and the tops of all the uprights may be sawn square and fitted with entablatures to carry pots of ornamental flowers and shrubs which may be placed in them in summer, being so secured that no wind that suddenly springs up may topple them from their places.



CHAPTER VIII.

ABOUT GARDEN DOORS, GATES, AND FENCES

Difference between Doors and Gates—The Garden Door Solid—Classification of Garden Gates and Fences—Plain Wicket Gate—About Hinges for Gates—Hanging Gate—Varieties and Names of Hinges—Common Latch for Wicket Gate—How to Fix it—Fixing Latch—Alternative Forms of Open Gates—Semi Solid Gate—Garden Gate with Stop-Chamfered Framing—Bar Latch and Catch for Gate—Another Ornamental Garden Gate—Gothic Garden Gate—Entrance Gate of Large Size for Garden—Ordinary Field Gate—Construction of Gate—Ordinary Open Fencing—Notching and Mortising for Rails—Methods of Tenoning and Jointing Rails—Paling of Larch and Scotch Fir for Garden—Strengthening Paling with Hoop Iron—Alternative Fence of Oak and Deal—Park Paling—Posts and Gravel Boards—Dwarf Fence of Stakes disposed in Form of Trellis—Dwarf Fence in Rustic Mosaic Work—Designs for Fences in Rustic Carpentry—Chief Characteristics of the Fences—Strained Wire Fencing—How to put up the Fencing—Straining Posts and Struts—Straining and Tightening Wires—How to straighten Wire from the Coil—Mopsticks—Their Utility in Fencing, Gate Making, etc.—Mode of using Mopsticks in Fences and Gates—Regulation of Distance between Rails—A Mystery of Amateur Carpentry—Preparation of Slips to receive Ends of Mopsticks—Insertion of Rails between Capping and Base Rail—Wooden Edges for Borders

576. THIS will be a very short chapter, and one which will be to a great extent devoid of the charm of illustration, as far as I can see; for the home carpenter by this time knows how to make a door or a gate, and how to put up a fence: there is, therefore, comparatively little margin left to me, either for remark or illustration, on the various items in garden carpentry that form the subjects to which the attention of the wood worker is now called. The terms "door" and "gate" are generally held to be synonymous, or different names for the same thing; and so they are, but here the force of association steps in, and makes a distinction between them; hence it is customary to connect the term "door" with a framing of wood, and wood only or of wood and other materials, such as glass, which is solid throughout and is hung in another framing which it fills entirely when closed, preventing passage from within to without and *vice versa*, above or below or on either side; and to connect the term "gate" with a framing of wood or iron, or both together, which is not solid throughout, and is hinged between side posts instead of being hung in a framing, and which in consequence, although it prevents passage at the sides, does not prevent passage above it at pleasure, and in the case of small animals, such as dogs and cats, does not hinder

Difference between doors and gates.

passage below it. If I am asked whence this force of association comes, I need only point to the doors of our houses, and the gates of our fields, and say that we never speak of these as the gates of our houses, or the doors of our fields at any time, because we commonly accept it that the door is the closure of an entrance to a building or erection otherwise closed in above, below, and around, and that the gate is the closure of an entrance to a far larger place that is enclosed or fenced in all round, but is entirely open above. And this holds good more or less even in the case of gateways that are closed by door-like gates hung or hinged to a massive framing, such as college gates which admit of direct access to an open space, visible to all when the gates are opened, although that access lies through a space walled up at the sides and covered in by a ceiling above. Therefore, in using the terms "garden door" and "garden gate," I wish to imply by the former, a piece of framed work that is formed principally if not entirely of boards, and by the latter a piece of framed work that is formed chiefly if not wholly of rails and styles.

The garden door, solid.

577. Now about garden doors, in the way in which I take them there is but little to say. The home carpenter knows already how to make a hedge door, which is the form a garden door would take if it were a door that afforded ingress to, and egress from, a garden that is enclosed by walls; I have shown how a hedge door is usually made, and how it may be made with more pretensions to symmetry and good appearance than are to be found in doors of the common type. I have sometimes, but very seldom it is true, seen a framed door in this position; but in this case, the framing of the door has been solid in its construction, and in the space between the hanging style and the falling style, no muntin has intervened, but the entire opening has been filled by trellis. Thus the great object of a solid door has been attained, if, as I believe it to be, the chief object of a closed up door in this position is to exclude dogs of small size, cats, and fowls which might otherwise find their way in, and cause detriment and disfigurement to crops and ground by digging and scratching, and in the case of fowls by tearing cabbages and other succulent plants such as lettuces, leaf by leaf, for green food, for which always they have a desire.

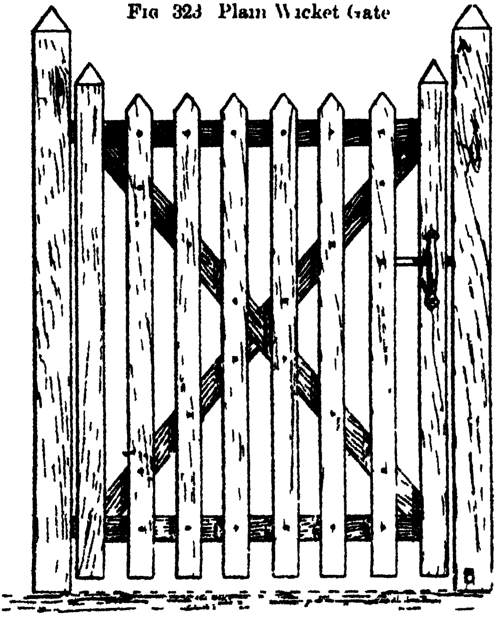
578. This disposes very quickly of doors that are impervious, or those through which no means of passage can be found when they are closed, and we have simply to deal with gates that are either partly or wholly penetrable, and fences both pervious and impervious. A garden door that is wholly impervious will have a sill to it, and be in every respect like a house door; but in other kinds of garden gates, whether pervious or impervious, open partly or

wholly throughout on the one part, or solid throughout on the other, there is no sill, and they must be so placed as to swing freely to and fro without touching the soil; and this of necessity compels us to leave an intervening space between the soil itself and the bottom of the gate. Now let us first consider the construction of two or three varieties of garden gates plain and ornamental, large and small, secondly, some of the means that are at our command, for hanging and fastening gates and for keeping them closed, and, thirdly, the construction of three or four varieties of fences close and open, that may be required for enclosure of ground or for its division.

Classification of garden gates and fences

579. The simplest, and at the same time the smallest kind of gate that the amateur can make, is a wicket gate, and this, taking an average size, is about from 3 feet 6 inches to 4 feet in height, and from 2 feet 6 inches to 3 feet in width—enough, in fact, to admit of access to any ordinary garden, paddock, or enclosure of no great size. In Fig 323, I have shown the plainest form of a gate of this kind, and, at the same time, one of the slightest. The styles are of quartering, 2 inches square, the rails are 2 inches by 1½ inches, and are halved or notched into the styles, as the maker of the gate may choose. Thus, the styles will project ½ inch beyond the rails, as the rails are notched in, so as to be flush with the back of the styles. As the gate is 2 feet 6 inches wide, and the styles are 2 inches wide, there will be a width of 30″ − 4″ = 26 inches between the styles, and this allows us to nail 6 battens, 2 inches by ½ inch, on the rails, leaving a space of 2 inches between each, because 6 battens, 2 inches wide and 7 spaces of the same, is exactly 26 inches. Gates are, or should be always, braced diagonally; and professional carpenters content themselves by putting in a single brace, extending from

FIG 323 Plain Wicket Gate



Plain wicket gate

the lower left-hand corner to the upper right-hand corner. The weight of the gate has a tendency to pull it downwards towards the ground at the falling style—at the style which falls against the stop nailed to the gate post to receive it; and the brace is inserted to counteract this tendency, and to keep the framing fair and square. I prefer myself, for the sake of symmetry and good appearance, to halve together 2 battens, 2½ inches wide by 1½ inches thick, in the form of X, or St. Andrew's cross, and put this in firmly behind the battens and butting against the styles and rails at the four points of jointure, as shown. The stop is nailed to the inside of the falling post, from A to B; and, naturally enough, as the falling style is partly hidden by it, it makes this member of the gate appear narrower. I have not shown it so in Fig. 323, because I wished to give a perfect front elevation of the gate. The hanging and falling posts are supposed to be formed of timber 3 inches square; and, as the back of the gate—that is to say, the face of the framing at the back—must be flush with the back of the gate posts, this causes the posts to project 1 inch beyond the face of the gate; and accordingly the stop required is, at least, ½ inch thick, or ⅝ inch planed down, and must be 1 inch wide. "Why must the back of the framing be flush with the back of the posts?" the home carpenter may ask. To this the answer is: Because the cross garnet or T hinges, by which the gate is hung to the hanging post, being in one plane when laid straight out, can only be attached to surfaces that are in the same plane; and provision must also be made for the latch which will be a bar, or equivalent to a bar, moving on a pivot, under restraint of an iron strap, or *quasi* strap, which prevents its motion beyond the extent of a very small arc of a circle, and falling after being lifted and released into a catch, which, from its resemblance to the figure 4, I may call a figure-of-four catch. Fig. 323 is drawn on a scale of ¼ inch to 1 foot; and any dimensions that I have not given may be readily ascertained by measurement on the diagram itself.

About hinges for gates.

580. Possibly the mode of putting on the latches and hinges may not be clear to some; and although it is not to my purpose to go into any lengthened disquisition on these fittings for gates, it may be useful to say a few words on the subject. Fig. 324 represents, on a larger scale, one of the cross garnets or T hinges, by which the wicket gate, shown in Fig. 323, is attached or hung to its hanging post. In 324 A represents the hanging post; B, the hanging style; C, the upper rail; and D D, two of the battens that are fixed to the rails vertically. The rail, it will be remembered, was notched or mortised into the hanging post: in the figure

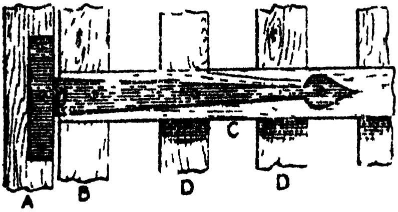


Fig. 324. Cross Garnet, or T Hinge.

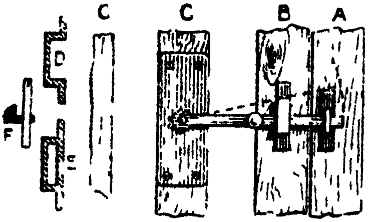


Fig. 325. Latch for Wicket Gate, showing Mode of Fixing.

Hanging gate

it is shown as being notched. The surface of post, style, and rail, are flush. All, then, that the home carpenter has to do is to draw a horizontal line along the centre of the rail, and fix the strap of the hinge to the rail, using this central line as guide, by aid of which he may put on the hinges evenly and straightly. When attaching it he must do it in such a manner that the part of the hinge by which the two pieces are connected, namely, the three loops which fit one between the two others; a pin passing vertically through all of them to hold them in place, projects slightly beyond the arris of the hanging styles. Get the gate in position, mark the places for the vertical plates of the hinges in case the gate should slip, and in doing this take care that a small space, equal, say, to the diameter of the joint of the hinge, is left between the hanging post and the hanging style. This is done that the gate may open freely without binding, which it will do, in all probability, if post and style are brought close together in hanging. Take care also that the intervening space is equal throughout, perfectly rectangular, and not closer at top or bottom. Then screw on the vertical plates, and the work of hanging is done

Varieties and names of hinges

581. The cross garnet hinge is so called from its similarity to the hinges with which some parts of plate armour were fastened together, and which were so called. Those used for armour were of course very small, but were of the same shape Butt hinges are generally used for hanging doors and sometimes for gates. They are cast, and consist of two rectangular plates longer than broad, and connected by three or five circular loops according to size, through which an iron pin is passed. Each plate is pierced with two or three holes, also according to the size of the hinge, and these holes are countersunk on the inside of the hinge to receive the top of the screws and prevent any part of it from projecting to interfere with the working of the hinge, and more particularly its closing. Its form is clearly shown in Fig. 326, in which the three loops *a a a*, are supposed to be attached to the inner edge of the plate A, and the two loops *b b* to the inner edge of the plate

B. The loops *b b* are inserted between the loops *a a a*, and the pin by which the plates are connected, and on which the parts of the hinge turn and work, is then drawn through the loops which, as already said, are perforated to receive it. Butt hinges are attached to edges of doors, and the face of the frame opposite and closely approaching the hanging edge of the door. Hanging a gate, door, window, or shutter by butt hinges is always a delicate operation, and one which is trouble to an unpractised hand. When the hinge is closed the edge of the style on one side and that of the post or jamb on the other, to which a gate or door is hung, should not extend further than the dotted line C D in Fig. 326. The method of fixing hinges will be more apparent from Fig. 327, in which the back of the plate B is shown closed down upon A. This plate is barred to its edge in the edge X Y of the style of the gate or door; a depression of suitable size having been cut out with a chisel to receive it. In the same manner the plate B is sunk in post or door jamb until its inner surface is flush, or, indeed, a little below the surface. If too much of the wood has been removed, a thickness or two of cardboard, coarse brown paper or wide shavings must be let into the groove, to diminish its depth, in regulating which the utmost nicety is required. Strap hinges are like the cross garnet hinge without the vertical piece. They terminate in a circular loop, and are hung on staples driven into the hanging post. Coarser and stronger varieties of this hinge, bent so as to fit over and on to three sides of the heavy hanging style of a field gate, are used for gates of this class. Hinges, to which from their form the name of **H** hinges has been given, consist of two plates like the vertical part of the cross garnet, or **T** hinge, similarly connected: **L** hinges are like the **H** hinges, with a horizontal arm proceeding from one end of one of the vertical plates. This, I think, is the extent of the information the home carpenter will require relative to hinges. He will find the sizes and pieces of all kinds of hinges and latches in the price list of any ironmonger in a large way of business.

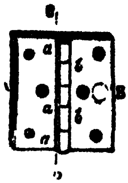


Fig. 326. Butt Hinge.

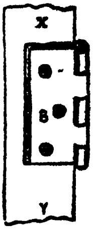


Fig. 327. Mode of Fixing Butt Hinge.

Common latch for wicket gate: how to fix it.

582. A good ordinary latch for a common wicket gate is shown in Fig. 325, and the way to fix it. The faces of the falling post A and the falling style B are, as I have already shown, flush; but the inner face of the batten D which is flush with the other side of the two styles and the gate posts lies back 1½ inches from the face of the

hanging style, which is just the thickness of the rail. In order, therefore, to fix the latch it will be necessary to attach a block of wood 1½ inches thick, and about 6 inches long, to the inner face of the batten nearest the hanging style; or to put a piece of this thickness along the entire length of the batten lying between the upper and lower rail, to which to attach the fixed end of the latch. This done, apply the square to the edge of the gate post, and draw a line in a horizontal direction across style, and block, as a guide in fixing latch, and let the lower edge of the latch coincide with this line. This done, put a screw through the fixed end of the latch, as a pivot on which the latch may move; if this end be riveted to a small square plate, as it often is, screw the plate to the block, keep the latch in the proper position by means of a small nail driven into the gate post in the pencil line, drawn to regulate the position of the latch and screw, over the latch in the position shown on B, the bent strap D, taking care that the lower bend of the strap, just or very nearly, touches the lower part of the latch, which can then be raised by means of the knob attached to it as high as the upper bend of the strap. The limit of motion to which the latch is then restrained is shown by the dotted line proceeding from the pivot of the latch, and the dotted arc at its end. Sometimes a form of strap in which the bent part is riveted to a plate of the same width as shown at E is used; and in this case the strap must be slipped over the end of the latch before fixing. Lastly, screw the figure-of-four catch shown

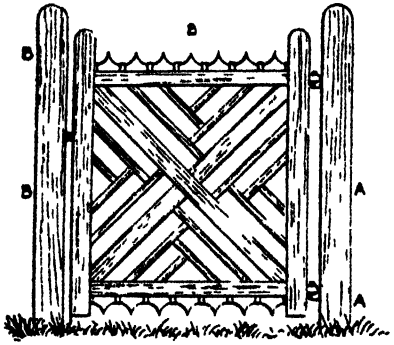


FIG. 328. Design for Open Wicket Gate.

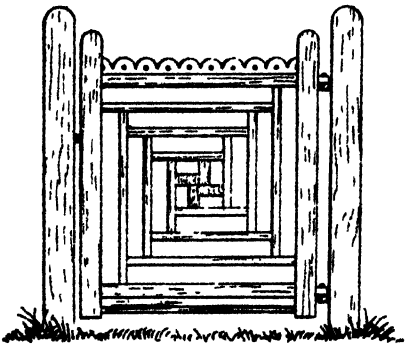


FIG. 329. Japanesque Design for Gate

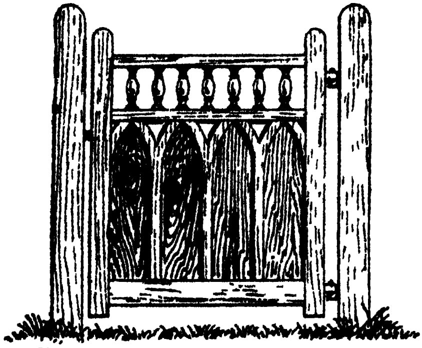


FIG. 330. Design for Semi-Solid Gate

in side view at F to the falling post, and so regulate it that the latch is raised just a trifle above the lower bend of the strap, and falls solid against the bottom of the catch within the nick. The outside of the catch is shaped as it is that the latch may move easily up it when the gate is pulled to on the other side. This completes the fixing of the latch, which may be raised on the inner side of the gate by the knob attached to it, and from the outside by passing hand or finger between batten and falling style and raising the latch. It will be as well to furnish means of pulling the gate to when open and closing it, by a bent handle put on in the position shown in Fig. 323, or by screwing a knob into the falling style. This completes the fittings necessary for the gate and the manner of fixing them.

Fixing latch.

583. Returning to a consideration of the wicket gate, I have given in Figs. 328 and 329 some alternative forms of small gates which may prove useful. In Fig. 328 the framing of posts and rails is strengthened by the insertion of stout diagonal braces, in the form of St. Andrew's cross; and the openings are then filled up with bars, disposed in Japanesque fashion. A cresting formed of small iron plates, of the form shown, fastened down by a square projection of iron at the end of each plate, into and under which the end of the next plate enters. This is a very strong and useful form of iron cresting, which I myself have had, and used; but I do not know if it can be obtained now. The same kind of cresting is put along the bottom, to cause a pleasurable sensation down the back of any dog that may attempt an entrance into the garden, under the gate. Another Japanesque design for a small gate is shown in Fig. 329, in which the bars, filling the space within the framing, are arranged vertically and horizontally as shown. Along the top rail is a piece of simple cresting of hard wood about ½ inch thick, which should be fixed in a groove ploughed in the top rail for its reception. The top of the cresting is cut in semi circular arcs with a keyhole saw, and a hole is bored through with a ½-inch centrebit under each arc to give a lighter appearance to the cresting. An iron cross bar, about ½ inch, or a little less, in diameter, is placed below the lower rail, to oppose the entrance of invading animals, who would, otherwise, struggle in under the gate, or, at all events, try to do so. This may be passed through holes, bored for it through the styles, or screwed to them by flattening and turning up the ends at right angles to the bar, and perforating these ends for screws. Either of these designs make pretty open gates.

Alternative forms of open gates.

584. In Fig. 330 a design for a semi-solid small gate is shown. In this three rails are used: two from 1½ inches to 2 inches square at the top, and

Semi-solid gate.

a rail at least 4 inches in breadth at the bottom. The space between the upper rails is filled with spindles placed at equal distances along the opening. These spindles may be purchased of any turner ready made for the purpose, or he will turn them to order to any desired pattern; but if the home carpenter possesses a lathe and can do a bit of turning he will, of course, do the work for himself. The lower part of the gate, between the middle and lower rail, is filled with boarding ½ inch thick, fitted into rails and styles in grooves formed for the reception of the panel, which must, of course, be put in place before the rails and styles are brought together and finally fixed. Upright and curved pieces must then be screwed to the panel on each side, as shown in Fig. 330, of sufficient thickness to bring them flush with the rails. The panel will then be arcaded with four panels with Gothic heads. The open spaces between the middle rail and the framing of the heads of the arches must then be cut away with a keyhole saw; great care should be taken to put the framing of the arches on one side exactly in correspondence with the framing on the other side, so that no irregularity may appear when the openings are cut. This also makes a pretty gate when finished. The home carpenter can, of course, put in headings of other forms if he prefer them, as, for example, semi-circular headings, or trefoil headings, and he may, if he likes, leave the heads of the panels square and solid below the middle rail, and fill them in with Japanese headings, as shown in page 116.

585 Home carpenters, especially those who may not be able to make original designs for their own use, will not be averse to having even more placed before them than those to which I have already called his attention. Therefore, I introduce here, in Figs. 333, 334, and 335, three designs for small gates that have already appeared in *Every Man His Own Mechanic*; and these, I may point out, will give him some forms for gate posts which exhibit ornamental alternatives to the plain posts figured in the foregoing sketches and diagrams. In the gate exhibited in Fig. 331 the rails and struts are a little narrower than the styles into which they are mortised; but the general principle of construction is the same as in the gate for which designs have been already given. In order to give lightness of appearance, the styles, rails, and diagonals are stop-chamfered. This should

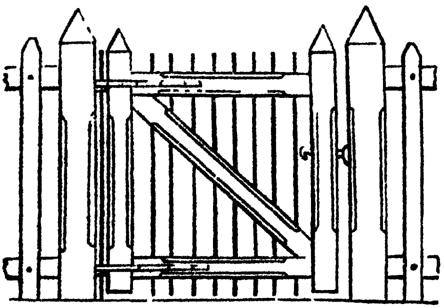


FIG. 331. Ornamental Design for Garden Gate.

be carefully done, exactly as it is shown in the drawing in respect to all the different parts of the gate, and in the same proportions. Holes are then bored in the top and bottom rails and the diagonal struts, through which bars of iron about ⅜ inch in diameter are driven. Care must be taken to use a bit of exactly the same diameter as the bars, so that they may fit tightly when driven through the holes. I have said "struts," but here let me remark that the maker of the gate may insert one or two just as he pleases. If he confine himself to one only, it should be the diagonal from upper right to lower left-hand corner, because this is more likely to counteract the tendency of the falling style to drop towards the earth in course of time through long use and action of the weather, and leverage exerted by the weight of the gate. For the same reason, if the parts of the gates are mortised together, as parts of a gate of this description should be, let the diagonal from upper right to lower left-hand corner be the entire one, and let the parts of the diagonal in the opposite direction be mortised into this one. Hinges, consisting of straps with loops at one end, are then fastened to the rails; and these loops rest on perforated plates driven into the hanging posts or otherwise secured. A vertical bar, with a shoulder near the top to keep it in place, is then passed through loops and plates; and on this bar the gate swings.

Gate with stop-chamfered framing.

586. A gate of this kind is best fastened by a short flat iron bar, with a slightly curled or curved end, beaten out horizontally, so as to be a little wider than the bar, whose depth is placed vertically. This bar is passed through a slot cut in the falling style of the gate, and works on an iron pin passed through style and bar. It is secured by the bar dropping into a notch cut in a piece of iron of some thickness, which is attached to the face of the falling post. The construction of this kind of bar latch and catch is shown in Fig. 332, in which A is a sectional view of the falling post, in that part of it in which the slot B is cut for the passage of the bar latch shown at C. The bar C works on a pin put through the style, as said; and on each side of the style, after the manner of the scutcheon on a keyhole, two slotted iron plates are screwed. These are shown in section at D and E, and in elevation at K. The bar latch is also shown as we view it from above at H. The catch is shown at F in its proper position—on the

Bar latch and catch for gate.

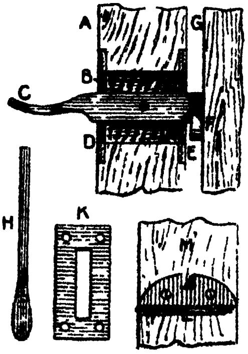


Fig. 332. Bar Latch and Catch for Garden Gate.

inner face of the gate post G, in end view; and it is also exhibited in front elevation at L; M representing the inner face of the gate post.

587. A good type of ornamental garden gate is exhibited in Fig. 333. This is composed of a central circle, four radiating bars, and an external frame consisting of two styles and two rails. The circular work in the centre is connected by mortise and tenon joints with the frame of the gate, and all these parts are stop-chamfered in order to give lightness of appearance, as I have explained when describing the gate last mentioned and illustrated. Readers, generally, will consider this to be too open a gate. So it is, but in the sketch given the centre and corners are left open purposely, because there are so many different modes of filling them. It is objectionable to leave them unfilled, because animals such as cats and dogs could go in and out through any of the openings at pleasure; with regard to the means and modes of making the gate cat and dog proof, the openings might be filled with panels, fitted in grooves made in the framing before the different parts are put together. In the central one a suitable rebate must be made on one side, into which the panel must be dropped, and the rebate above the panel then filled in and chamfered to correspond with the other side. If thus treated the gate in question would be made a solid gate. Again, the whole of the openings may be furnished with bars placed vertically or horizontally as the home carpenter may determine, but preferably vertically. Lastly, the lower corners only may be panelled, the upper ones and the centre may be barred, or all the openings may be filled with iron crestings, which may be bought for this purpose, but in this case the crestings must be made first of all, and the frame of the gate then made to suit them.

Another ornamental garden gate.

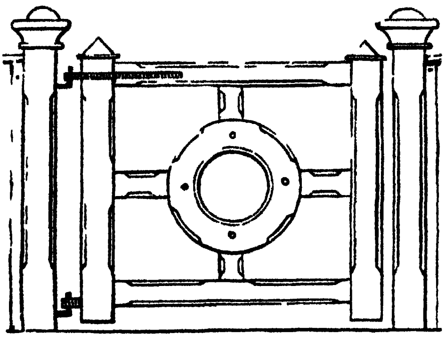


FIG. 333. Good Type of Ornamental Garden Gate

588. A massive garden gate, almost entirely solid and of what may be termed Gothic character, is shown in Fig. 334. The principal parts of this gate are the styles and cross rails, which are framed together by tenoning the rail into the styles. The lower part of the gate is filled with substantial boards grooved and tongued together. These should be V jointed, a form attained by slightly bevelling the edges of each of the boards, so that when they are brought together the joints assume a V form.

Gothic garden gate.

In the upper part the corners are filled with pieces cut to form an oval or ellipse on each face, but broadly chamfered or hollowed within, so as to form four points springing out from the under edge of the curve. The open centre is partly filled with a simple ornament in wrought iron, consisting of four bars halved together at the centre, and having shorter pieces springing from each side of the arms of the cross. The four arms should be made longer than the opening by 1 inch each way, and be inserted in the oval before the framing and panels are finally brought together. It should be fastened with a latch actuated on one side by a heavy swing handle, and on the other by a knob. The handle should proceed from the centre of a cruciform plate, as shown in Fig. 325, and the bar should drop into a catch fixed on the side of the falling post.

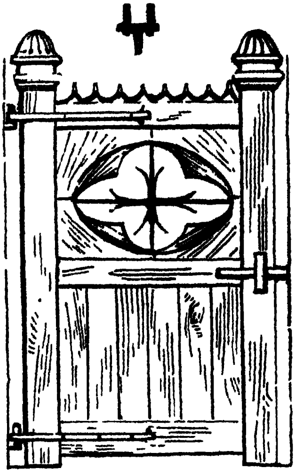


Fig. 334. Gothic Garden Gate.

589. Here I may bring to an end my remarks on small gates, with just a reference to the design for a larger gate shown in Fig 335. If the home carpenter looks closely at this he will see that half of it will be a good design for a small gate, which may be varied again by turning the design half round and bringing the upper, middle, and lower rails, which are now horizontal, into a vertical position. The upper and lower rails would then become the styles, and the middle rail a vertical bar dividing two pairs of elongated St. Andrew's crosses, instead of extended and compressed crosses as at present. I need not say much about the construction of the large entrance gate shown in Fig. 335, which might be made from 5 to 7 feet in length, and from 3 to 4 feet in height, because this is self evident from the design itself, coupled with the details of construction which have been

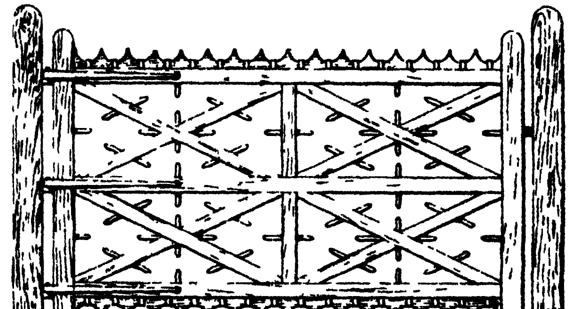


Fig 335. Design for Large Entrance Gate to Garden, etc.

Entrance gate of large size for garden.

already given for smaller gates There is, however, one peculiarity about it which it is necessary to notice It is very open in form, more than usually so, in fact, and to counteract this in some measure, iron bars are inserted in the rails, the central upright and the diagonals in the positions indicated As the gate is a heavy one, it is hung by three strap hinges screwed to the upper, middle and lower rails, furnished with loops that fit on to strong staples driven into the hanging post.

Ordinary field gate

590 As I am now dealing with gates, I may as well go on to the end of the subject now, and finish my remarks with a description of the ordinary field gate, which is represented in Fig 336 In this the supports of the gate are formed by two stout posts, A A, the lower ends of which, B B, are left rough so as to give them better holding when put into the ground It will do no harm to remind the home carpenter that when these posts are put into holes dug for the purpose they must be set upright by the aid of the plumb level and then surrounded with brickbats, stones, gravel lime rubbish etc which must be beaten in tight with a rammer To make the gate two styles, C and D, are first cut out, and then five or six rails, as G G etc are mortised into and through the styles, and wedged up as tightly as possible The styles of such a gate I may say would be about 3 inches wide, and 2 inches thick, and the rails from 2½ to 3 inches wide, and 1 inch thick, and the mortises in the styles should be 1 inch wide to receive the ends of the rails without appreciable reduction The hinges, E F, are put on along the top and bottom rails They consist of a loop of iron, which slips over a staple driven into the hanging post, and two tongues or straps of iron which pass along the style on each side, and then along the top or bottom rail as the case may be, being bent to clasp the rail as well as the hanging style, and pierced at equal intervals with holes, through which small bolts are driven and riveted It will be obvious to the reader that this gate, in common with all gates, will have a tendency to drop towards

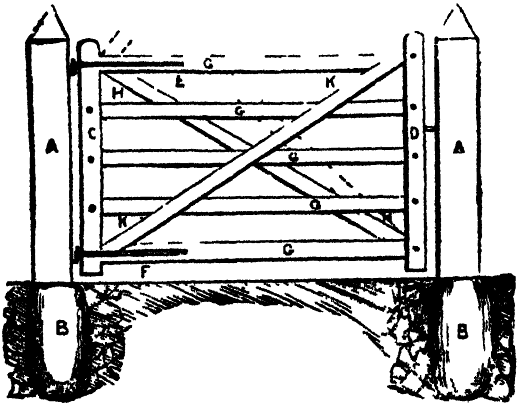


Fig 336 Ordinary Field Gate

Construction of gate

the ground, which will be increased in this case by the great length and weight of the gate. To counteract this and to keep the end of the falling style from touching and dragging against the ground, struts or diagonal braces, H K, should be put across the gate from corner to corner, in order, as I have previously explained, to take the strain off the rails and throw it on the bolts and straps of the upper hinge. The ends of the struts are butted against the styles. Sometimes only one diagonal is used, and in this case it does not matter in which direction it crosses the gate. Sometimes, in order to increase the angle at which the strut crosses the rails, or, in other words, to render it less acute, a piece of timber is mortised in the hanging style, projecting in a direction slanting upwards, over the plane in which the rails lie, and the diagonal is brought between the end of this projecting piece and the bottom of the falling style, as shown by the dotted lines in the illustration. Sometimes, and this is better when the timber is wide enough, this projecting horn and the hanging style are cut out of one piece of wood. Elm or ash is better than deal for making gates of this description. Field gates are fastened with a hook attached to the falling style with a staple, and dropped into another staple driven into the falling post. Sometimes they are fastened by means of a long spring latch, consisting of a long piece of iron bar with a knob at the upper end, and fastened at the bottom, riveted at the bottom to a plate of equal length, which is screwed to the edge of the falling style. This is held in place by a staple placed in a horizontal position, and fastened to the strap near the top. This prevents the free end of the bar from going in an outward direction beyond the length of the staple. The gate is fastened by the bar dropping into a catch similar to that shown at L in Fig. 332, but placed horizontally across the face of the falling post, instead of vertically.

591. From gates we must pass on to fences, of which the gate may naturally be considered as forming an essential part. For gardens of the ordinary kind open fencing of sufficient strength may be easily and quickly made by posts about 6 or 7 feet in height, which is sufficient to allow the post itself to be set from 2 feet to 2 feet 6 inches in the ground, leaving from 3 feet 6 inches to 5 feet above ground, as the case may be. These posts, if of sawn wood, should be from 3 inches to 4 inches in width, and from $2\frac{1}{2}$ to 3 inches thick, and should be set in such a way as to present the broad side of the wood to receive the rails. If of round wood they should be at least 4 inches in diameter, strength being an essential requisite in all cases, for fences offer considerable resistance to the wind, even if open; and a high fence in an exposed position will stand no chance

Ordinary open fencing.

probably many times in one place and another; and in putting in the rails the end of one is first inserted as far as it ought to go, and then the end of the next rail is driven well and closely up against it. As the rails are put in, each successive post should be set up, tested with the plumb level, and the hole then filled up, and rammed solidly round the end of the post in the ground. If the posts were tightly rammed before the rails were put in there would obviously be grief and trouble for the home carpenter. In Fig. 338 the mode of jointing round rails into round posts in rustic carpentry is shown. In this a vertical view of the bevelled tenon is shown at A, and a plan of the tenon when viewed from above at B. The sides of the post at C are notched to the depth shown on both sides, so that the flat end of the rail from which the tenon proceeds may butt against a flattened surface as far as possible. If the post is not recessed the end of the round part of the rail should be slightly cut in a direction sloping inwards on both sides from the mortise to the tenon, so that the rail may, as it were, grip and clip the post, and the joint be thus rendered as close and sightly in appearance as possible.

Paling of larch and Scotch fir for garden.

595. The fence that forms the boundary of a large garden, and of a small garden too, if the home carpenter does not mind time spent in labour, and money in materials,--should always be of a fair height, say from 3½ feet to 4½ feet at the least, or even 5 or 6 feet if thought desirable. An excellent fence of wood of good appearance, about 5 feet high, and open to a certain extent, may be formed as follows: larch trees, averaging from 6 to 9 inches in diameter, should be stripped of their bark and then cut into lengths, measuring from 8 to 9 feet for posts. Holes for these posts should then be dug in the ground from 3 to 4 feet in depth, and the posts put in and rammed firmly in place in the usual way, notches having been cut in the posts beforehand for the reception of the rails Care must be taken to keep the posts upright, and truly aligned and upright in the manner already described above. The posts may then be connected by three strong rails of Scotch fir, notched into posts from their front surface, to the extent of the thickness of the rails, which may be from 2 to 3 inches thick, and about 4 to 5 inches wide. Vertical palings of barked larch, formed by sawing young trees down the centre, should then be nailed on, leaving a space not less than 2 inches or more than 2½ inches between them. The palings will average about 4 inches in width, and before they are nailed in the space between centre and centre of successive pales should be marked so that they may be put on in a truly vertical position. If equal distances are measured from edges of palings at top and bottom, and successive palings set to

this, they will soon be thrown out of the perpendicular, and the symmetry and beauty of the fence will be destroyed. The palings should be pointed at the top, as shown in Fig. 339. No piece of wood can look neater or stronger than this; and if the posts are partially charred for a foot above and below their junction with the soil, that being the point where wooden posts always decay first, and, consequently, where the antiseptic property of charring would be most valuable, and the whole coated with Stockholm tar, the fence would last for years. The construction of this fence is well shown in Fig. 339, in which A exhibits the elevation, and B the plan when viewed from above, as well as a section, the line running along the top of the post showing the extent of notching required to let in the horizontal rail.

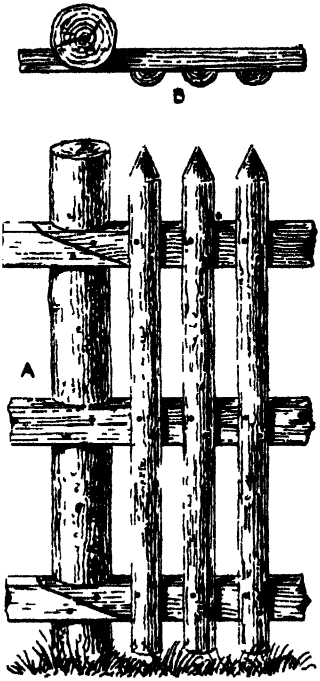


FIG. 339 Garden Fence of Larch and Scotch Fir.

596. It may be further observed respecting this kind of paling, that it is better to notch the rails into the posts only to such a depth that their outer surface is flush with the front surface of the posts, and, by way of imparting a better finish, an upright similar to those on the right of the illustration may be nailed to the face of the post. The jointure of the rails is clearly shown at the top and bottom rail, and is such as has been already described in a previous section. The upright to be nailed to the face of the post over the jointure of the rails at top and bottom is not shown in the illustration, because introduction would render the mode of joining the rails less plain and perhaps less intelligible to some who may not have carefully read the section to which I have referred. The paling may be strengthened to resist any attempt to destroy it by nailing horizontal strips of hoop iron both inside the rails and on the outer side, curving them round the posts on one side and the palings on the other, and nailing them to the rails as well as to the palings. A similar kind of garden fence, as sightly in appearance and even more durable, may be made of posts formed of oak instead of larch, the horizontal rails and vertical palings being also sawn out of oak or cut of good sound deal. This fence may be coated

Strengthening paling with hoop iron.

Alternative fences of oak and deal.

with Stockholm tar, or the wood may be painted or varnished only, according to taste, although varnishing will be found to be somewhat expensive. Coal tar should never be used for garden fences. It is useful for common wooden fences that are not conspicuously brought into sight, or on the score of economy; but Stockholm tar is lighter in colour and more transparent than coal tar, and is, therefore, better suited for the better class of wooden fences, when tar is used as a protective coating against wet, and the action of the weather taken generally.

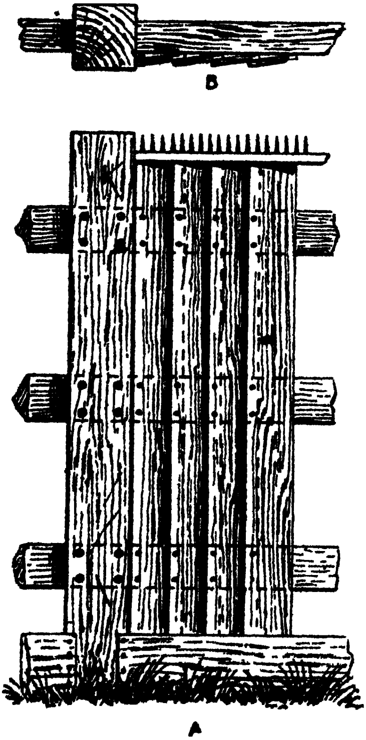


Fig. 340. Garden Paling of Oak.

Park paling.

Posts and gravel boards.

597. Another handsome kind of wooden fences is that which is ordinarily known as "park paling," and which is illustrated in Fig. 340. In this fence, as in the larch fence shown in Fig. 339, the mode of construction is the same, although the details are different; for the posts are of the same length, and set in the ground at the same distance apart, and to the same depth. They are, however square in shape, being sawn out of pieces of oak in order to bring them to this form, but they are squared only as far as they appear above the surface of the ground. below the surface they are left in their original state for the sake of imparting additional strength and solidity to the fence, and better holding power when set in the ground. From post to post at the base, and touching or even entering the ground, boards from 8 to 12 inches in width, called gravel boards, are placed, the ends being let into notches cut to receive them, or butted against clumps of wood nailed to the sides of the posts. A combination of these two modes, that is to say, the notch and the clump, as well nailed to the side of the post at the edge of the notch, will form the strongest fencing at this part. Above the gravel board, three rows of arris rails are mortised into the posts, the ends of the triangular rails being cut in a rectangular form,

and when inserted they are held in place by pegs or trenails of oak, as they are technically called, driven into holes bored into the posts and through the rails by means of a bit and brace, or a twist drill held in the brace. When this is done, staves of rent oak, about 4 or 5 inches in width, which the home carpenter must purchase at the wood yard, are nailed against the rails, as shown in Fig. 340, in the elevation of the fence at A, and the section at B, each stave overlapping that which has been fixed immediately before it, after the manner of weather boarding. This is shown so clearly in the illustration, the dotted lines showing the extent of the overlapping of the staves, and the direction of the arris rails, that no further explanation is needed. The fence is finished at the top by a capping of deal, through which, before it is nailed in position, strong nails have been passed point uppermost, so as to form a series of short but strong spikes along the top. When finished, such a fence as this should be varnished.

598. In these fences, examples have been given of a good open fence, and of a good close fence—of a fence that is comparatively cheap and involves but little labour in its construction, and of another that will be more costly, both on account of the material that is used in it, and of the labour that must be expended on it. Such a fence as that which is shown in Fig. 340 may, perhaps, be improved by the substitution of brickwork for the gravel board at the bottom; and when made on this principle such a fence would be inferior only to a brick or stone wall for garden purposes. With regard to dwarf fences, I have already spoken of these under trellis work; but even at the risk of committing the deadly literary sin of repeating myself, I will again draw attention to them here by giving in Fig. 341 an illustration of a fence made of rough stakes disposed as rustic trellis work. Rustic fences such as these are appropriate for garden purposes, and are attractive in appearance, and may be made useful in separating one part of the garden or grounds from another. This, as well as the fence in rustic mosaic work shown in Fig. 342, can be made of pieces of hazel, larch, spruce, or, indeed, poles and loppings

Dwarf fence of stakes disposed in form of trellis.

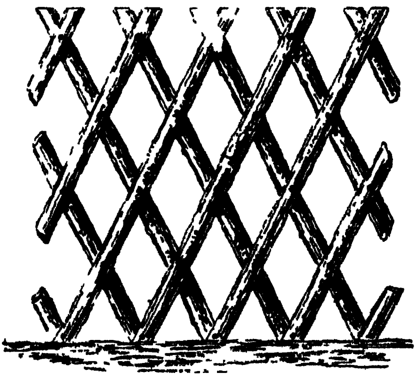


FIG. 341. Dwarf Fence of Rough Stakes disposed as Rustic Trellis Work

Dwarf fences in rustic mosaic work.

of any young trees. The bark should always be left on; and, for the trellised fence, the rougher and more numerous the knots, the more rustic in character will the fence appear to be. The bars of the fences shown in Fig. 341 should be slightly notched one into another at the points in which they cross, so that they may have a better bearing one against another, and a firmer holding than round sticks can possibly have, if nailed together without notching. For the rustic mosaic work shown in Fig. 342, sticks of hazel, maple, willow, cherry, etc., must be sawn asunder lengthways, and then into pieces as required to form the mosaic. These pieces must be nailed on backing of strong boards; and if the fencing be of no great length, the mosaic work may be repeated on the other side in the same pattern, or one that is altogether different. Variety in all things is said to be charming; and I suppose this will hold good for fences and patterns of mosaic work in fencing, as well as in other things.

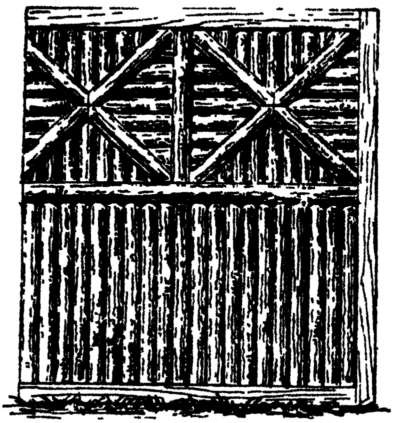


FIG. 342. Solid Dwarf Fence in Rustic Mosaic Work.

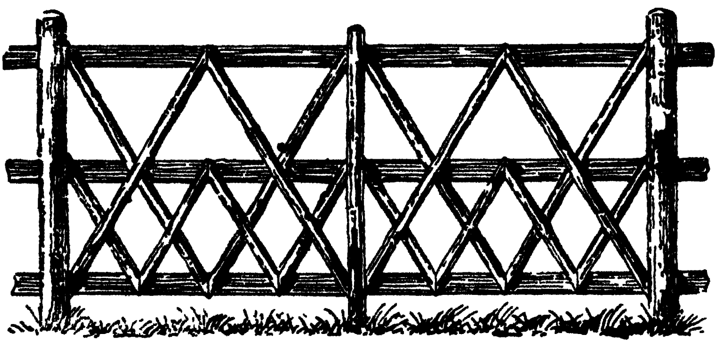


FIG. 343. Design for Garden Fence in Rustic Carpentry.

Designs for fences in rustic carpentry.

599. Acting on this principle, and knowing that the propensity for reiterating the demand, "Give, give," is as strong in the amateur wood worker as it was reputed to have been in the horseleech's daughter, I respond to this laudable, and by no means unreasonable craving. I place at his disposal in Figs 343, 344, and 345, three light and pretty designs for work of this description. For these designs I am indebted to my friend, Mr. Arthur Yorke, whose skill as a designer of work of this kind, and as a proficient in making all kinds of useful and ornamental structures of

this kind, is unrivalled. In his estimation, a fence 3 feet 9 inches high is a fair height for a fence intended to repel invasion of the garden by cows and horses; and that if sheep and pigs are the only animals whose entrance is to be guarded against, 3 feet will be sufficient. But how about fowls, some of which, unless their wings be clipped, would make their way with ease over a fence much higher than indicated? They can be restrained from making their way through the fence, especially if it be an open one, like that shown in Fig. 343, by wire netting; and to hinder advances from above, the best way is to set poles in the ground, slanting slightly towards the quarter whence the fowls are likely to come, and to attach wire netting all along the line, from pole to pole, causing the bottom of the netting to be coincident with the top rail of the fence. In the three designs now brought under the reader's notice, the fences are supposed to be 3 feet 9 inches in height, the posts rising above the ground to the height of 4 feet; not less than 2 feet should be allowed for the posts below the surface. The main posts are supposed to be placed at a distance of 8 feet apart—a good distance for strength—though fencing posts are often set at longer intervals, say 9 or 10 feet. Nothing, however, is to be gained by this; for the weakness of too long a stretch of rails is not to be compensated by saving the

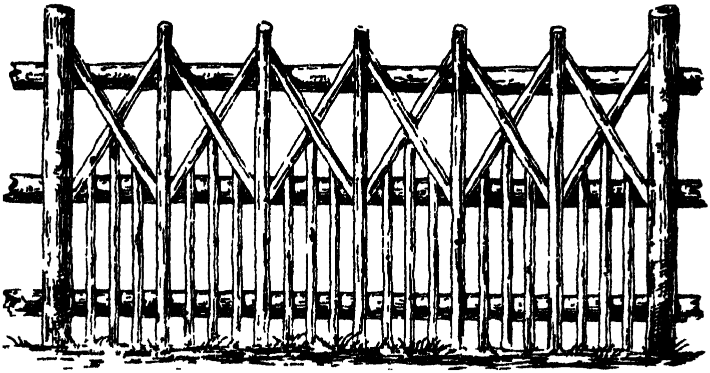


FIG 344 Another Design for Garden Fence in Rustic Carpentry

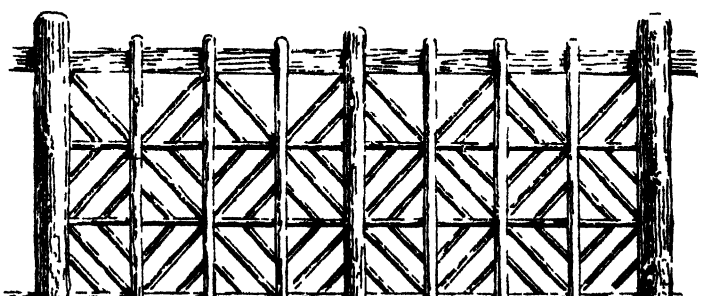


FIG 345 Third Design for Garden Fence in Rustic Carpentry.

cost of two or three posts. The scale on which the designs are made is $\frac{3}{8}$ inch to 1 foot.

Chief characteristics of the fences.

600. I have spoken about the weakness of a fence in which the posts are too far apart, and the rails too long; but this is in a measure guarded against by the insertion of a smaller post midway between the main posts, for which a hole is made in the ground by means of an iron bar or "pitcher," the post being then driven into the hole as far as it will go. With regard to the chief characteristics apparent in the three fences, that which is shown in Fig. 343 is light and simple. It has, moreover, no great amount of timber in it, and will not cost much in either time or labour to put up. It will, moreover, look well in any situation in which it may be used. The openings in the lower part, however, are large enough to admit of the entrance of young pigs and lambs; and to prevent this recourse must be had to wire netting, as already advised as a safeguard against poultry. In the fence shown in Fig. 344, dangers from without are more amply guarded against, as the palings in the lower part are set at a distance of about 3 inches apart, through which nothing larger than a small chicken or a young rabbit could make its way. The fence shown in Fig. 345 comes midway between the other two in point of security, being more open than the second, but less open than the first, but it can be safeguarded in the same way as the others. The reader will further notice how well adapted the designs given in these three illustrations are for gates both small and large, whether in rustic or in plain carpentry, and that they may be made of sawn wood, and battens from the wood yard, as easily as from young trees and rough poles and stakes.

Strained wire fencing.

601. As I have gone pretty deeply into the subject of fences, I may as well finish up and make a clean breast of it, by describing just two other kinds, and then I will bring this chapter to an end. At all events, I will try to do so, although I fear the odds are ten to one against it. One of the kinds to which I am alluding is strained wire fencing, which is useful for separating lawns in which flower beds and borders form a conspicuous feature from pasture land for cattle, when it is desirable to have nothing in the form of a closer fence that might tend to break the view. The gauge of the wire to be used will depend very much on the strength of fence required; but the home carpenter may obtain all necessary information on this subject from his ironmonger. I need only tell him that the higher the number of the gauge, proceeding from No. 1 upwards, the less will be the substance and diameter of the wire, and the greater the length, or rather the number of feet to the hundredweight. There is but little

How to put up the fencing.

Straining posts and struts.

appreciable difference of cost, the prices ruling pretty much the same throughout. To fix wire fencing of this kind, stout posts, say from 3 to 4 inches square, and preferably the latter, are required at each end of the fence, with spurs or struts to enable them to withstand the strain of the wires. The intermediate posts, which merely carry the wires, and help to keep them in the same straight line, are smaller in size and slighter; and these may be from 2 to 2½ inches square. Holes, just large enough to admit of the easy passage of the wire, should be made through the posts before they are put in the ground, as it is easier to do this before they are put into the positions they have to occupy and are fixed than after. The way in which such fences are put up is shown in Fig. 346, in which A is the straining post, or end post, sawn out of fir or oak, but having the slab-wood left on at the bottom, as in the case of the hanging and falling posts of the field gate, and as shown at B, to give it a better holding in the ground. It is clear that when the wires are tightened, the strain of the upper wires will have a tendency to draw the top of it inwards, in the direction shown by the arrow. To resist this, a strut C is placed in the position shown, one end of which butts against the straining post A, and the other end rests on, and is secured to, a shoe in the form of a long, broad, and thick piece of timber, D, at right angles to the strut, which, in other words, is perpendicular to it The better mode of securing the strut is to sink a shallow recess, about ½ inch deep, and corresponding in width and thickness to the transverse section or end of the strut, in which the end of the strut itself may rest. The pressure of the strut C against the shoe D, caused by the strain of the wires, is distributed all over the surface of the board D, instead of being concentrated at the spot on which C rests, and is met by the resistance of the earth below the board from E to F. Consequently, the larger the area on which the board rests, the greater will be the resistance of the earth, transmitted first through the board D, and then concentrated through C, against the straining posts.

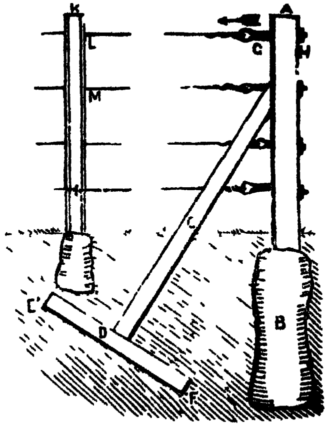


Fig 346 Straining Post and Strut, and Intermediate Post for Wire Fencing

602 The straining and tightening of the wires is effected by means of bolts, such as are shown at G, with an eye or loop at one end, and a nut and

screw at the other. The wire is drawn as tightly as possible through the eye of the bolt, and secured by twisting the projecting end round the wire. The nut H is then turned up by means of a wrench; and as this nut moves up the screw cut end of the bolt, the bolt itself is brought further and further through and beyond the outer face of the post, and the wire is gradually tightened. The lighter intermediate post is shown at I.; and the wires, as I have said, may be passed through holes bored through the post as at L, or pinned down to the exterior of the post with a staple, as shown at M. Bolts may be used at each end of the wire, but, if the fencing be short, one set of bolts will be sufficient; the other end of the wire being looped and passed through the opposite straining post, and a stout nail, or piece of iron rod, passed through the loop to prevent any possibility of the withdrawal of the wire.

Straining and tightening wires.

603. Great trouble is often experienced in dealing with wire: it is always sent from the ironmonger in the form of a coil; and when the home carpenter attempts to lay out the coil and get the wire into suitable form for passing through the holes in the posts, the wire will conduct itself in a most obstinate and reprehensible manner, refusing to submit to the efforts that the amateur wood worker is making to uncoil it, and lay it straight. He may, however, avoid any trouble in this direction by first passing the whole of the coil through a contrivance for straightening it, which I will now tell him how to make. Possibly he may have a spare trestle or sawing stool: if not, he must use his own *pro tem.*, or make another, appropriating the old one to this purpose. Lengthways through the centre of the surface of the stool draw a straight line, as shown in commencement by the dotted line in the plan B. Along this line, and close to the edge of it, drive in eight or ten stout wire nails, or iron pins as shown—by iron pins I mean pins cut from stout wire or pieces of fine stair rod. Then let an assistant gradually lift the wire, circle by circle, from the coil; and let the home carpenter thread the end through the pins, as shown in the plan B, and pull it towards him. He will find that the wire will straighten out beautifully, as he draws out sufficient to form a length, he may cut it off by aid of a saw file, and then proceed to straighten the next length. Wire working is always unpleasant work—at least, it is to me; but the way I have suggested is the

How to straighten wire from the coil.

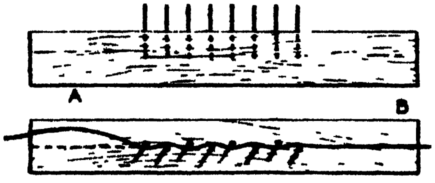


FIG. 847. Simple Apparatus for Straightening Wire, in Side Elevation (A) and Plan (B)

best, and, indeed, the only way of straightening coiled wire, and so rendering it fit to be dealt with for fencing. The common custom is to use end posts and strainers of iron, and intermediate posts of iron also, which, of course, are much slighter in substance, but as strong as wood, if not stronger. The home carpenter will, however, wish to have more of his finger in the pie than he can possibly have, if he has iron posts and struts; and therefore I have given him the chance of making these and the intermediate posts in wood

604. I have spoken from time to time about mopsticks, and the various uses to which they can be put when sawn lengthways down the centre; and I will now show how the amateur carpenter may make use of them with advantage to himself in fencing and making gates. The mopstick is the rounded handle which is used for mops and sweeping brooms, and is 4 feet 3 inches in length, and 1⅜ inches in diameter. If bought singly they cost from 1½d. to 2d. each, but when purchased wholesale in bundles, I dare say they would not cost more than 1s. per dozen, which is a mere trifle,—a nominal price,—when the home carpenter considers the time and labour, to say nothing of the cost of material, that he would have to expend in sawing a board 1¼ inches into strips 1¼ inches square—it would be slightly less after planing down on the four sides first the board and then the rough sides of the slips, after sawing and then taking off the arris to give the rods or sticks the rounded form in which he requires them. All this

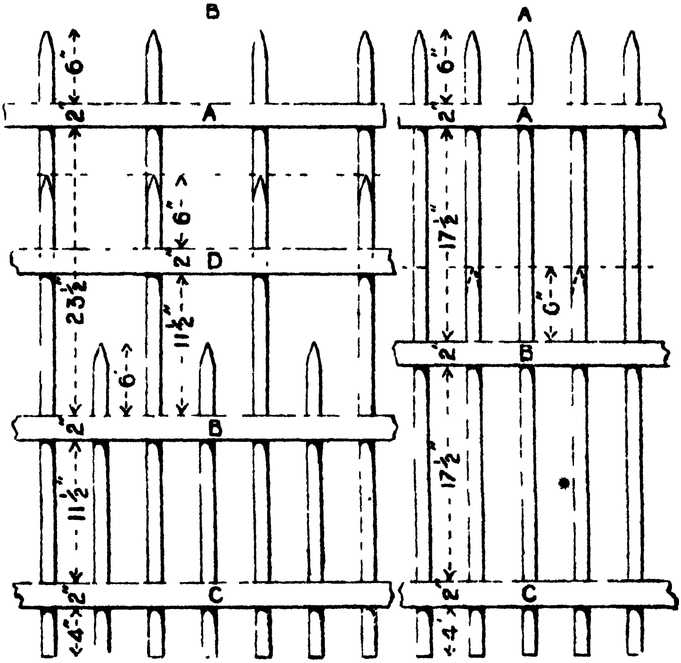


FIG. 348. Modes of making Fencing with Mopsticks

Mopsticks: their utility in fencing, and gate making, etc.

is avoided by using the mopstick, which may be purchased of the ironmonger, or at any shop where turnery is sold. I have exemplified their use in Fig. 348, in which two methods of using them are shown, namely at A, in which they are used primarily of their original length, and, secondly, as wholes and half sticks in B. When used in this way there is no waste whatever; but there are other modes in which waste must be incurred, as it is impossible to do otherwise than shorten some of them; and yet, after all, the pieces by which some are shortened need not be regarded as being utterly wasted, because when sawn in half the semi-mopsticks may be used as mouldings, and thus be redeemed from becoming mere material for lighting fires, to which purpose the waste and shavings of the amateur carpenter's workshop is, or should be, appropriated.

Mode of using mopsticks in fences and gates.

605. The diagrams exhibited in *Fig.* 348 are drawn on a scale of ¼ inch to 1 foot, and in A the mopsticks are used, all of them at full length, and therefore the fence or gate that is made from them would be 51 inches in height. I have not given the posts in which the rails are tenoned or halved—better tenoned, but the posts would be square or rectangular in form, and of sawn wood of necessity. I have not shown them because I have said enough about posts and rails and their connection, and on this point the home carpenter cannot possibly be at a loss. I am obliged, however, to show the rails, which should be at least 2½ inches wide, and 2 inches deep, the width lying horizontally and the depth placed vertically; thus in A the rails A B C are 2 inches deep. Holes 1⅛ inches in diameter are bored vertically in them, the centres being disposed along a central side marked with the marking gauge 1¼ inches from either vertical face, or side, along the top. The rail A is 6 inches below the top of the mopsticks, the rail C 4 inches at its lower surface above the bottom of the mopsticks, which should clear the ground, whether in fence or gate, by above 2 inches; the rail B is equidistant between the two. Now, the space or length already accounted for out of the 51 inches is 16 inches, namely, 6 inches at top, 4 inches at bottom, and 6 inches for rails taken conjointly, thus there are 35 inches remaining, and there must be 17½ inches between centre rail and rails at top and bottom. In B, in which whole and half mopsticks are used, there must be an essential difference in spacing between the rails, in order to get the tops of the half mopsticks the same distance above the rail as the whole mopsticks are above the top rail; and as the length of a half mopstick is 25½ inches, of which 14 are accounted for by spike at top rails and piece at bottom, we get 11½ inches as the distance between middle and bottom rail, and 23½ inches between

middle rail and top rail. This is disproportionate, but unavoidable under the circumstances.

606. The question now arises, what can we do to get rid of the manifest want of proportion in B? Two courses are open to us; but first let me say with regard to A, that if we wish to shorten the intermediate rails, we can do so by cutting them off 6 inches above the rail. And here we first come in contact with what I have characterised as "waste"; for each intermediate rail must be shortened by 21½ inches, but due proportion between sticks and distances between rails is preserved. In this case the home carpenter must remember not to bore intermediate holes in the top rail A. If I have not said so already, let me say now, so that the railing thus formed of mopsticks looks better if the tops of the sticks are brought to a blunt point as seen in the diagram, instead of being left square as at the bottom. In A, then, to get equi-distance between the rails, place short sticks, intervening between the longer ones, every intermediate stick must be shortened between the long ones; but in this case the full length of every other stick is preserved, and the fence is carried to the greatest height possible with the material for upright bars that we propose to use; but in B it is altogether different. In this the intermediate short sticks are kept at their full length, and we must perforce shorten the intervening long sticks to the extent of 12 inches, reducing the height of the fence to 39 inches. Still, as with A, a nice looking fence is obtained, well proportioned in every respect and from every point of view, and the waste is only 12 inches on every other stick throughout the whole length of the fence in B, compared with 21½ inches on every other stick in A. It is open to the home carpenter to make the fence in the manner in which it may best please him to do so; but whichever may be the system he adopts, let him not forget to preserve equi-distance between the rails, as this, after all, is the chief requisite in all fencing of this description.

Regulation of distance between rails.

607. There is yet another way of making a nice looking and substantial railing with mopsticks, in which there is no waste at all, and in which—although half mopsticks are used—the height of the fence from foot of lower rail to the upper surface of the top rail of capping is the greatest possible. In this, the height of the fence itself is 29½ inches, being 4 inches for joint depth of rails, and 25½ inches for semi-mopsticks. But the reader will say: If this be the case, the railing cannot possibly be connected with the lower rail and the capping; and how can this be, and the fence or railing be rendered firm and secure, and proof against tumbling to pieces? Well, this stretching out of the fence to the utmost limit in height is just one of the mysteries

A mystery of amateur carpentry.

of amateur carpentry, which I will proceed to explain, premising that the professional carpenter would have bored holes for the ends of the vertical bars at least ½ inch in depth in both lower rail and capping, and thus reduced the height of the fence by at least 1 inch, making it 28½ inches instead of 29½ inches. If the reader will examine Fig. 349, he will note a narrow strip, say ½ inch in depth above the lower rail, and resting on it, and the same thing just under the capping; and this possibly may lead him at once to see through this little dodge in non-professional wood working. At A, in Fig. 349, the railing or fence is shown complete, with the base rail below and the capping above, proceeding in the first instance from its attachment to the post on the right, which is just barely indicated, and which may be of some height as in a verandah, or rising but a few inches above the capping, and surmounted itself by a small entablature, as shown, or rather shadowed, at C.

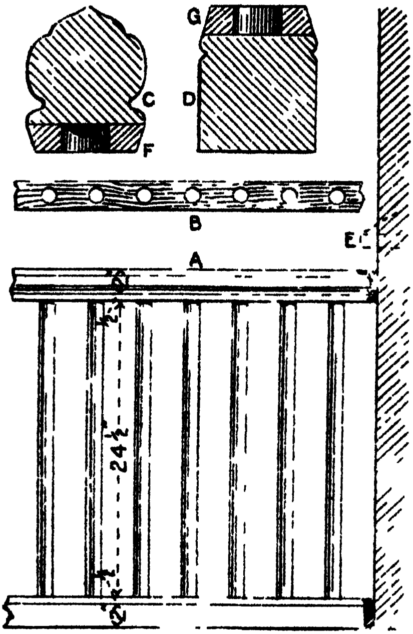


FIG. 349 Capped Railing of Mopsticks

608. Between post and post, corresponding in length to base rail and capping, which are fixed in position, first of all, before the mopsticks are put in place, two slips of wood are laid; and these are slightly bevelled along the edges, as shown at F and G in the sectional view of the capping and base rail, given at C and D. These are 2 inches in width at the widest part, and about 1¾ inches at the narrowest, the bevel being but very slight. Along the centre, longitudinally, of this ½-inch slip, on the widest side, and on the narrowest side as well, two lines are scored by the marking gauge, set to 1 inch; and the surface on both sides is then spaced out in accordance with the number of pieces of mopstick to be used. With a fine bradawl, pierce holes at every transverse crossing, made where the spaces are set out, by aid of square and pencil, and see that the holes proceed direct from the upper to the lower side of the slip and come out exactly at the crossing, which they will do, if the lining out has been made with precision. The holes thus made

are useful in guiding the point of the centre-bit used in boring the holes, as shown in the plan of one of the slips exhibited at B. It will save time, and bring about exact correspondence of holes in the upper and lower slips, if they are lightly bradded together with thin wire nails, so that both may be bored through at one and the same operation; and in this case it will be better to leave the bevelling until the boring of holes is completed. I need scarcely say that the width of the centre-bit that is used should correspond exactly with the diameter of the mopsticks.

Preparation of slips to receive ends of mopsticks.

609. This done, insert the ends of the mopsticks into the holes made in the slips, using but gentle force in pushing them into place, lest there should be any mishap, and the slip, split or otherwise, brought to grief; and let the ends of the mopsticks protrude beyond the surface of each slip for about ¼ inch. If any easing is required in getting the mopsticks into place, reduce the end of the mopstick that cannot be got comfortably into the hole intended for its reception, by sand-papering it down, or shaving it lightly and by degrees with a keen knife. When this has been done, with the aid of an assistant, who will hold one end while the home carpenter is dealing with the other, let him coax the ricketty railing thus produced, or formed, between cap and base rail. Then the aide-de-camp requisitioned still holding the end railing in place bring the slips into place against both cap and base rail with a few light taps of the hammer here and there; and when everything is duly adjusted and in place, brad or screw the slips to the members of the railing against which they are bedded and butted. You will find that the fencing has been entirely cured of the rickets, and that the bantling, which but a few minutes before showed but slight signs of promise, has developed into a sturdy offspring and outcome of manual work, well calculated to withstand any assault that may be made on it from without as well as from within. I commend fencing made in this way for verandahs, porches, etc., to the attention of all amateur wood workers.

Insertion of rails between capping and base rail.

610. I said the odds were ten to one in favour of my finding something else to talk about before I got to the end of this chapter; and after all it occurs to me that I have omitted to say anything about wood work as applied to the edges of borders. And here let me protest strongly against the use of wood in lengths in this position, for at the best it looks tame and insipid to a degree. If, however, the home carpenter finds himself constrained to do so, let him endeavour to impart piquancy and solidity to it by using lengths of elm roughly sawn, and having made the upper edge

Wooden edges for borders.

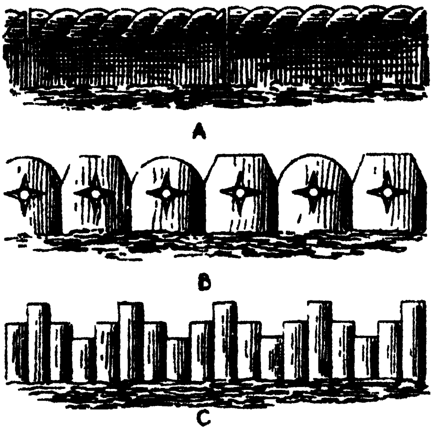


FIG. 350. Suggestions for Edgings of Wood to Borders

straight, nail to it 9-inch lengths of mopstick as shown at A in Fig. 350, on both sides, and by the aid of a rasp work it as shown into the semblance of black or blue Staffordshire garden tiles for edging borders. Let from $\frac{3}{8}$ to $\frac{1}{4}$ inch intervene between the pieces of mopstick, and continue the *quasi* division on the board by a deep V, cut with the edge of a sharp chisel as shown. Fix in the ground by nailing stakes to the inner side of the board at suitable distances. A second form of edging is shown at B. This is formed of cask staves, sharpened to a point, or nearly so, below, and fashioned at the top as shown, by rounding the top of some, cutting off the corners of others, and driving them into the ground in alternation. The bits of stave should not be less than 12 or 13 inches long. They may be pierced with a centre-bit, and a star-like form imparted to the hole by surrounding it with four notches, cut out with a chisel as shown. A third form is shown at C. This is formed by cutting stakes and small poles similar to runner bean sticks into short lengths, and threading them on wires in the manner shown at C. A stake of some length should be left at intervals to be driven into the soil, to impart stability to the edging. Bordering of this kind is naturally possessed of great flexibility, and is well calculated for edging beds of any kind, and especially those whose outline is curved in any way. I could give any number of edgings of this sort; but these will be sufficient to put the home carpenter on the track, and act as suggestions which he may mould to his own wants and purposes, if he has any fancy for things of this sort.

CHAPTER IX.

WINDOWS, PORCHES, AND VERANDAHS: THEIR CONSTRUCTION, ORNAMENTATION, AND UTILISATION.

Subject Matter of Chapter—About Window Boxes, and Levelling them—Ornamentation of Window Boxes—Extension of Window Box Construction and Fixing of Trellised Arch—Adaptation of Box and Trellis for Upper Windows—Porches as Places of Shelter—Porch of Simple Character in Rustic Carpentry—Alternative Design for Side of Porch—Purposes of Porches added to Houses Position or Aspect of House Character of Porch—Dimensions of Porch—Difficulties in Building Porches—Nature of Porch: Door—Materials for Building Porch Framing below Roof—Roof: How Constructed—Tympanum—Mouldings—Window Frame—Ring for Lamp—About Verandahs—Construction and Character of Verandahs—Utilisation of Verandahs—Verandah as Cool Vinery—Construction of Cool Vinery—Suggestions for Verandah Green-Houses.

Subject matter of chapter.

611. I AM now within measurable distance of the end of this, the Second Part of this book, and I have yet many things to write about. I have done with what I may call the odds and ends of garden carpentry, and I have now to deal with structures that form an integral part of the dwelling-house itself, and with structures that may or may not assume this form, that is to say, structures that may be made adjuncts, annexes or affixes to the main building, or which may be entirely independent of it, and form small structures which are isolated from it and are complete in themselves. I will leave all buildings of the latter class for another chapter, and deal with objects that come within the former category, namely, windows, porches, and verandahs here. I have in the chapter headings indicated my intention to deal with the construction, ornamentation and utilisation of these places of the dwelling-house; but this must be understood to apply generally. Manifestly I have nothing to do with the construction of *windows*; as windows of a house and the time and place for dealing with *lights*, namely the lights of a frame or greenhouse, has not yet come. No house is windowless, but many are without porches and verandahs, to which these adjuncts would form ornamental and useful additions; but I can fairly deal with the utilisation of windows for ornamental purposes, and this I will at once proceed to do.

612. And, firstly, although every home carpenter must know how to make a window box, still I may be able to say something about it which will add to and expand his ideas on the subject. As a matter of course, as

About window boxes, and levelling them.

window boxes are generally placed on window sills, the size of any box for this purpose, that is to say, its length, width, and depth, must be adapted to the size of the sill on which it has to stand. This holds good for all window boxes *per se*, but it is possible to make window boxes on another principle to which this general rule does not apply; but I will speak on this point presently. Let me now take the opportunity of reminding the home carpenter, that the upper edge of a window box should be level throughout; but as sills are "weathered" as it is termed, or, in other words, bevelled, to a downward and outward slant from the frame, to admit of the speedy discharge of the rain that falls on it on to the border, path or grass below as the case may be, the box when set on such a sill would slant forward too. To obviate this, and to provide for proper ventilation and aeration of the mould and roots of the plants that are in it, there should be a space open to the air between the surface of the window sill and the bottom of the box; and this is all provided for by simply nailing to the bottom of the box A, in Fig. 351, a piece B of the shape shown. The box, when placed in position on the sill C, is then perfectly level at the top.

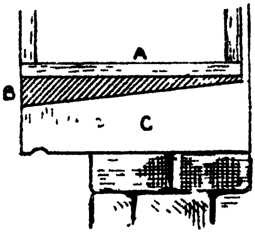


Fig. 351. Levelling Window Box on Sill.

613. Of the ornamentation of the *front* of such window boxes there is no occasion to say more here, save and except that adornment by rustic mosaic work is most appropriate, and that this has been already provided for in a previous part of this book. A rough and ready style of external covering of the surface of the front of the box either by mosaic work, the rough bark of forest trees, imitation of brick with sides of virgin cork, as it is called, and similar kinds of coating, is most appropriate. All actual tiles, whether intended for pavement, or painted and glazed to form the sides of grates and hearths, set in framings of wood, are out of place, and should be carefully avoided. It is usually the custom of all who possess window boxes to fill them with plants only. A few will make an attempt to cover the sides of windows by creepers trained on wires or even string sustained by rails driven into the brick work; but beyond this nothing much is done. It would be better far to line the sides of the windows between the frame and the arris of the brick work with thin wood, and to place about an inch from this covering a few vertical rods, about $\frac{3}{8}$ inch in diameter, or stout wire about $\frac{3}{16}$ inch in gauge, ranged in position like billiard cues in a rack, with the lower ends resting on ledges in narrow cleats nailed across each end of the

Ornamentation of window boxes.

window box, and others that have been fastened to the linings of the sides before they were put in place by screws driven through from its inner side of the lining.

Extension of window box

614. Now, there is no reason whatever to my mind why the limited sphere of window box gardening should not be extended, and the capability of the window box for flower culture be augmented, by bringing out the window box itself in an outward direction from the window, and allowing it to project for some distance, say 12 inches, over the flower border or bed, below. To do this, and to support it on a mere framing placed at the sides, or in front, or, to reduce the question of support to a minimum, by simply nailing a couple of stakes to the edges of the box in front, would be both unmeaning and ugly. But suppose a mode of treatment such as that which I have suggested in Fig. 352 were adopted, the general effect would be good, and the capacity of the window box itself would be more than doubled. As the home carpenter ought by this time to be able, metaphorically speaking, to run alone, and to work out plans and elevations, and working drawings for his better guidance in the performance of the actual manual work required, I have given in this case a perspective sketch, which indicates, far more effectually than could be done by mere geometric drawings

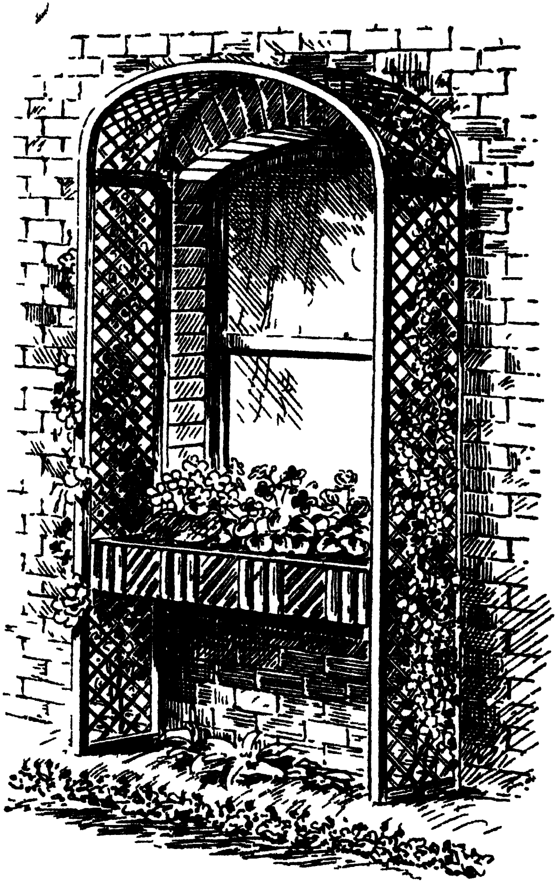


FIG. 352. Suggestion for Extension of Window Box and Ornamentation of Window by Trellised Arch

to scale, my aim and meaning, and the general aspect and character of the system of extension and ornamentation when carried out and completed. There is nothing more in this than what any one who has carefully followed me through the foregoing part of this book could easily take in hand, and as easily accomplish. The box itself, instead of just reaching the front edge of the sill, or an inch or two beyond it, is brought forward to the extent of 12 inches beyond this; and the fore part of the box rests on, and is supported by, a couple of cleats, slightly arched in form, one of which is nailed to the trellis on one side, and the other on the other side. The trellised arch is just the measure of the extension of the box in width; that is to say, it is about 12 inches wide, and is carried up the side and round the top of the window by which it is environed.

Construction and fixing of trellised arch.

615. It may be desirable, however, in the interests of some of my readers to go a little more exactly and definitely into the construction of the trellis work round the window, its limit, and the method of fixing it. In itself, the trellis work forms a depressed or Tudor arch at the top; this mode of structure being adopted in order to assimilate it and subordinate it as much as possible to the flat arch, which is usually turned over the tops of windows to afford support to the superincumbent mass of brick work that is piled above it. A Norman or semi-circular arch, or a Gothic arch, might be used instead; but I fear its effect would be in a great measure nullified and spoiled by its being crossed horizontally not much below the crown of the arch, by the almost straight lines of the brick work below, unless some ornamental work, after the manner of that shown in Fig. 353, were placed over the window, so as to hide the brick work and flat arch, and so afford some motive for the arched heading to the trellis. This may be done by covering the brick work with a thin piece of boarding, and overlaying the boarding with fretwork, lightly carved, to add to the general effect. The boarding below may be painted with a darker tint, and the fretwork with a lighter tint of the same colour. The inner uprights of the trellis work are brought to the edge of the reveals of the opening for the window; that is to say, the edge of the exterior surface of the wall, just where the brick work turns rectangularly and meets the frame of the window, which, as it were, is set in it. Of course, the width of the trellis work must

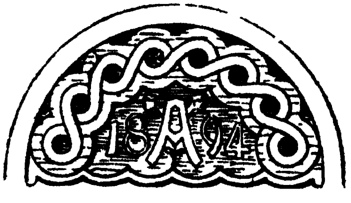


FIG. 353. Ornamental Work in Brick Work over Window with Flat Arch on Top.

be regulated by the width of the window, as measured on a rod that has been applied to the embrasure of the window, and is marked exactly at the reveals. The trellis work must be made before it is fixed, and great exactness must be resorted to in determining the width of the arch between the standards. When made, the uprights should have their *inner* faces in the same plane as the surfaces of the reveals, and should butt with exactness against the outer surface of the brick work of the arch. The box should have been made and put in position first of all, and, when placed, should find its supports on the sill behind, and a stool or trestle placed temporarily under its edge in front; and it should be tilted slightly backwards, so that no hindrance may be offered to the introduction under it of the cleats nailed to the inner faces of the uprights on which it is ultimately to rest. The trellis work must be fixed and clipped to the brick work by iron holdfasts driven into the wall, and turned at one end to grip the wood. When the trellis work is secured, the stool must be withdrawn, and the box allowed to settle into place on the cleats, and screws should be driven upwards, or askew, through the cleats into the bottom of the box, to prevent any dislodgement. To give an appearance of strength, although it will in no way impart strength, a piece of wood, cut in the form of a shallow arch, may be screwed to the bottom of the box and to the standards of the trellis on a cleat, stretching across from standard to standard, in the same position as the arched piece, and resting on two small brackets fastened to the inner faces of the standards. Climbers of any kind may be planted in the border, under the window, and trained to the trellis on its exterior; and others may be planted in the box itself, and trained to the trellis on the inside. Thus, a pretty style of ornamentation may be carried out for windows on a ground floor with very little trouble, and at very little cost; and if the windows face from south-east to south-west, a pleasant shade may be obtained in summer in the room within from the creepers that are trained on the trellis.

616. As it is perfectly within the bounds of possibility to carry out the arrangement described above for windows of first floors and floors above this as far as the extension of the window box and the environment of the window opening by trellis work are concerned, it may be as well to say so, merely pointing out that means should be taken by the use of iron hooks and eyes and iron straps combined with holdfasts driven securely into the brickwork, and by brackets fastened to the box in the form shown in Fig. 354, to prevent any chance of the box from making a precipitate descent at any time to the ground below, to the damage and detriment of any one who might be loitering

Adaptation of box and trellis for upper window.

or labouring there at the very time. Further, the box should rest on a strong and stoutly made bracket fixed to the wall below. I have endeavoured to make the manner of doing this clear to the home carpenter in Fig. 354, although it is somewhat difficult to do so. The horizontal and upright pieces A and B are jointed together by halving, and are then connected by three horizontal rails, the ends of which are shown at C D E. Of these, C is halved into B, D is mortised into A, and E is mortised into B, but the tenon only reaches as far as A, which is halved into B. Moreover, it is only a half mortise and tenon, just sufficient to catch in and hold, and in form and dimension is just an inch every way, supposing the bracket to be made of quartering 2 inches square, as it should be. Another and a stronger way would be to make two frames, each of two ends and two rails, and then screw them tightly and closely together, the inner rail of the frame of which, A, would form an end resting on and screwed to the upper rail of the frame, of which B would form an end; the rails of the frames would thus butt against the wall which is shown in section at W, the depth of the reveal of the window, and consequently the width of the box from front to back being shown by the dotted line X Y. The stone sill of the window is shown at Z, the shaded part being always visible; the part which is not shaded being covered by the ornamental boarding which is carried round below the window box N and fastened to the block L, which is placed on the arm A of the framing, to keep the box in a level position when combined with M, which is firmly screwed to the top of L, and runs back over the sill to the point Y as indicated in the diagram shown in the illustration.

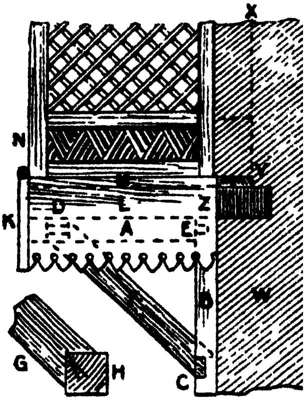


FIG. 354. Fixture of Box and Trellis for Upper Windows.

617. The trellis work is framed, and forms with its standards and rails at the foot of the trellis work an oblong frame corresponding in size to that portion of the end of the box which stands out beyond the wall, and is firmly screwed to the end of the box, the space within the framing being filled with rustic mosaic work. The standards of the trellis are gripped to the walls by holdfasts, and the top of the trellis work moulded as suggested above, according to the fancy of the wood worker. When the back part of the framed bracket has been placed in position and securely pinned to the brickwork behind it,

the latter having been plugged where needful to ensure a firm holding for the nails that are used, whether they be large cut nails or large wire nails, struts must be inserted, as shown at F in Fig. 354, and more plainly at G and H, in which G shows the manner in which the strut must be notched at each end, and H the sectional view of the lowest bar of the back framing, and on referring to this figure the effect of this is seen, the notches of the strut gripping the front bar and the lowest bar, the former as indicated at D, and the latter at C. Three struts might be used, one in the centre, and the others one at each end of the bars. When the struts have been duly secured by nailing the notched extremities to the bars, the window box may be put in place and trellis work also. This brings our consideration of the ornamentation and utilisation of window openings in the walls of a house to a close. Doubtless many other modes might be described and figured, but this will suffice to put the home carpenter on the track.

Porches as places of shelter.

618. Porches naturally come next; and possibly it may occur to the reader that windows have been treated very much in porch fashion. This may be so to a limited extent, but access *viâ* window to any room in a legitimate manner is rendered rather more difficult by the presence of the window box and trellis; and this is not the case with the porch. Both afford means of shelter, but the trellised window does not and cannot afford shelter *to* any one outside the house, whereas the porch does. Indeed, the primary object of the porch is to afford temporary shelter from rain or wind, or the rays of the meridian sun in summer; and in this and the possibility of constituting it a shelter for plants, is found its utility. Thus regarded, a porch, or *quasi* porch, should be attached to, or form part of every house, whether projecting beyond the line or place of the front of a house, or recessed by moving the front door and its framing back about 3 or 4 feet into the passage, and thus forming a covered place in which a caller may stand in shelter, and await the coming of some one or other from within the dwelling to answer the summons of those without who, by bell or knocker, notify a desire for admittance, or to deliver goods, messages or letters. And here let me remind the reader that provision should be made in every front door to receive promptly by slit and letter box whatever the postman may bring; for in the present day there is no one so subjected to Government sweating, and so poorly paid for his work, as the heavily-handicapped, and much-enduring postman; and nothing should be omitted by the householder to help him in his Mercurial work by enabling him to hasten on his way without let or hindrance by waiting response to his knock or ring at the

front door, though I must admit that no summons is so promptly answered by mistress or maid as that of the postman.

Porch of simple character in rustic carpentry.

619. Again my friend Mr. Arthur Yorke comes to my assistance with a design for the simplest kind of porch that can be made; and this is in rustic carpentry, a style of work which, as I have pointed out before, is admirably suited for the country. In towns, where it is not so appropriate, perhaps it may be imitated in form and pattern by the substitution of quartering planed up for the posts, and ornamental panels, and trellis work for the filling in of the sides; but the roof may be carried out in the same way, by imitation of tiling in wood, as shown already in page 415. I have gone into construction so much, and so often, that there is no occasion to go over again an already thrice-told tale, and to indulge in repetitions that would indeed be as vain as those of ancient heathendom. The design that is given is such as will supply shelter only, and this but imperfectly, at the partly open sides. The material is such as is used for all buildings and erections in rustic carpentry. It must be pointed out that half posts, or poles, should be used for the inner standards, because the sawn sides will fit more closely to the walls of the cottage to which the porch is annexed. In the gable there is a cornice of fir cones, fixed with wire nails to the pieces of half stuff, which hide the rafters and boarding of the roof. The filling of the sides, either partially or wholly, with oak bangles, or bits of other wood, affords a better means of giving support to the creepers, by which such a porch should be covered, both at sides and on roof. The rafters, which are bidden from view in the illustration, should be made of poles, sawn in half lengthways, the flat side being placed uppermost to afford a better resting place for the ornamental boarding, or other material that is to form the roof. Sheet metal, or galvanised iron, corrugated or fluted in

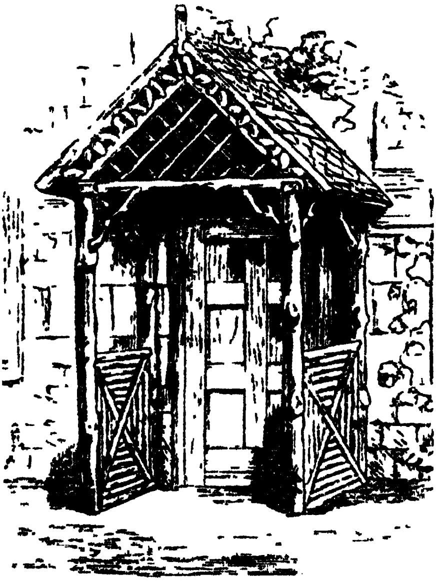


FIG. 355. Simplest Form of Porch in Rustic Carpentry.

form, may be used as roofing material; but in this case, rough trellis work should be placed about an inch or two above it, to sustain the greenery which is to surmount the roof and hide the metal work below, as well as to supply means of attachment for the climbers that are to contribute to form the greenery itself, and spangle the roof and sides with flowers. Within, if the porch be high enough, the porch may be lined with panels or rustic mosaic work attached to these.

Alternative design for side of porch.

620. In Fig. 356, I have given another design for the side of a simple porch, also from the facile pencil of Mr. Arthur Yorke. The remarks which I have made in the preceding section apply equally to this design as to that which is given in Fig. 355; and I further insert this here, because the home carpenter will find it useful in dealing with simple verandahs in rustic work, of which I shall speak presently. I must now, however, hasten on to regard porches as adjuncts and annexes to dwelling-houses from other points of view; and, in doing this, the purpose to which the porch is to be chiefly put will constitute with every one an important consideration. I have already gone at considerable length into the principles of construction, that will apply more or less to every kind of building that the home carpenter will take in hand, and in which wooden framing plays a conspicuous part; and instead of devoting time and space to travelling over this already well-trodden part again, to make a few remarks on matters intimately connected with porches for houses, which, possibly enough, are seldom taken into consideration by those who build them. The porch is too often viewed as being but of little importance beyond that of affording support to different kinds of climbers that it is wished to grow against it, and for which the porch already described would answer the purpose fully as well as any other. There are, however, other things to be taken into account; and these I will now proceed to consider.

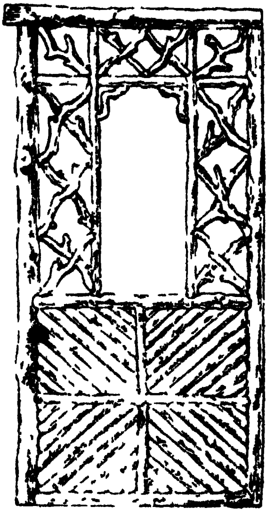


FIG. 356. Design for Side of Porch in Rustic Carpentry.

621. Now, when the home carpenter has made up his mind to put up a porch, before or by the main entrance, or "front door" of the house in which he lives, let him first seek to arrive at a clear perception of the purpose

which induces him to do so. Is it intended to operate mainly as a shelter to the interior of the house itself—to render the house warmer and more comfortable "when the stormy winds do blow," and to act as a breakwater, so to speak, and modify in some measure the furious rush of wind—cold, chilling wind—that often renders it a matter of difficulty to close the front door, when it has been opened in response to a summons by bell or knocker, set going by some one who waits without, in the teeth of a wind that blows from a cold quarter, towards which the house fronts. The rude wind enters and sets all the inmates shivering, and unceremoniously slams chamber doors, with a report that reminds the deafened hearer of "the minute gun at sea"? In this case one must consider *position*, or, what means much the same thing, *aspect*. If, however, the part of the house in which the front door, and, in all probability, the main windows of the principal reception rooms are situated, is possessed of a more genial aspect, so that the porch may be fairly regarded as being as ornamental as useful, he should then determine whether, when regarded from the standpoint of utility, he means to make it a kind of vestibule or lobby to the hall within—"the front or place before the principal, or head door," as the Germans have it, or an approach to the front door, intended to assume an aspect that will be attractive, chiefly on account of that which it contains. In these cases the *purpose* to which the porch is to be mainly put must be taken into consideration—*purpose combined with form*, which will unite in exercising an influence on construction, which cannot be neglected or left out of account. And in every case, no matter what may be the primary intention of the builder of the porch, *character* and *dimensions* will have to be carefully thought over; and every point that I have indicated will have to be carefully weighed before the builder can attempt to realise the outcome of his thoughts and reflections, and go to work with materials and tools in downright earnest.

Purposes of porches added to houses.

622. To make the meaning of all that I have advanced above perfectly clear, and to prevent any chance of leaving the reader in a fog, I had better say a few words on each point that I have emphasised in the preceding section. And, first of all, let me deal with *position or aspect*. Now, of all the winds that sweep the face of the earth from different points of the compass, those that come from the north, north-east, and east, are accounted the coldest—least to be desired, and most to be guarded against by shelters and other contrivances; and those from the south, south-west, and west, the warmest, and therefore the most welcome; although a strong south-

Position or aspect of house.

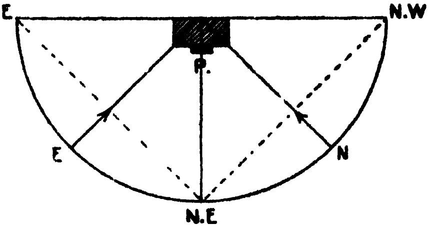


Fig. 357 Diagram illustrative of Position or Aspect of House.

westerly gale, accompanied, as it too often is, by heavy gales, is as bad sometimes as either of the others that are deservedly deprecated, as those who live in exposed positions on the southern coast of England often find to their cost. Now, suppose the house which I have placed at the centre of the semi-circle shown in Fig. 357, has a direct north-easterly frontage, it is manifest that the unfortunate insides catch it to their hearts' discontent whenever the "clerk of the weather" turns on the wind at any point from north to east, and a little bit to the southward or westward of these two cardinal points in the compass. Frequent colds, coughs, and the all-prevailing influenza, are frequent consequences of invasions of wind from these quarters; and the unhappy home carpenter who has unfortunately fixed on a house fronting and facing this uncongenial quarter, resolves to build a porch at P, just before the front door, to act as a break to the force and fury of the winds that I have designated, and to enable the inmates to get in and out with a little more ease and comfort than has hitherto fallen to their share. Now, under these conditions, how should the porch be built? I will tell you what I should do if I lived in such a house. I should build a porch with two doors, as shown in Fig. 358, in which A is supposed to represent the position of the front door, and B and C the opposite doors of the porch D: one having a south-easterly aspect, and the other a north-westerly aspect, so that when the wind blew from any point between north-east and north-west, I should use the door B as forming the best protected way in and way out; and *vice versâ*, when the wind blew from any point between north-east and south-east, I should use the door C, in each case keeping the door that was not in use locked and bolted up until a change of wind made it desirable to reverse the procedure. I should glaze the upper part of the front of the porch opposite the front door. In such a case as I have represented, the porch would in all probability take the form of a lean-to—at all events, this would be an easier form than any other for the home carpenter to adopt. I think what I have said will fairly show the necessity of considering the position or aspect of the house in putting up a porch.

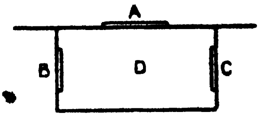


Fig. 358. Porch for House with North-Easterly Aspect.

623. I need not dwell so long on, or go so deeply into, the other points of which *purpose* comes first on the list. By "purpose," I mean that the home carpenter should consider - the aspect of the house being a warm one, and therefore a pleasant one—whether he intends to equip it with side seats or settles, supposing the entrance to the porch to be opposite the front door, or with staging on the ground for flowers, and a shelf for flowers also, running midway across the glazing of the sides. In the former case, the porch will be built to court shade rather than the light; in the other, it will be sought to admit as much light as possible, with plenty of air, to promote vigour of growth and beauty of bloom in the plants. In the former case, there would be more wood than glass in the porch, and in the latter more glass than wood, the porch itself assuming the aspect of a miniature conservatory. As a matter of course, *form* will be influenced by the mode of construction adopted; for what would be suitable and desirable in one case, would not in all probability be so suitable and desirable in the other. This will be sufficient on this part of the subject.

Character of porch.

624. With regard to *character*, I mean that the home carpenter should carefully note and study the style of architecture in which his house has been built, before designing his porch. Modern houses are built in many varied forms now-a-days; and if the style of the porch did not accord with the style of the house, incongruity would be the result, and in all probability elicit such unfavourable remarks from his friends, that the unhappy amateur wood worker will be led to wish he had not built it, and regard the structure with dissatisfied and jaundiced eye. It is impossible to do more than throw out a general *caveat*; but to be forewarned is to be forearmed, and I hope that in no case the danger flag which I hold out will be disregarded, or my caution, like the forewarnings of coming evil that the neglected Cassandra uttered to the Trojan warriors, be uttered in vain, and thus thrown away.

Dimensions of porch.

625. Again, the question of *dimensions* will always be a vexed one; and the home carpenter must here be left to cut his coat according to his cloth, and decide for himself. In other words, he must be guided by the size of his house, in precisely the same manner as he must be guided by the character of his house, in determining the extent of the porch. It may be taken as a general rule, that the frontage of a porch should be in excess of its depth, that it should not project to an abnormal degree beyond the *façade* of the house. As a general rule, if the frontage of the porch be represented by 3, the depth of the porch would be represented by 2, that is to

say, supposing that a porch with seats on either side within, was set at about 4 feet 6 inches, or at the utmost 5 feet for frontage, the breadth from entrance to front door should not be less than 3 feet, and should not exceed 3 feet 6 inches A porch to be used as a conservatory on a small scale may be larger Now, in all these points I am writing for dwellers in detached houses and cottages in the country, rather than for dwellers in towns and the suburbs thereof, in which long rows of houses are too often built in a stereotyped fashion, No. 100 being a faithful replica of No. 1, so that if the front door latches and latch keys correspond, as they sometimes will, there is every chance of a late home comer, who has been spending a convivial evening with a friend, finding his way into the wrong house, and himself, as a natural consequence, in the wrong box. In all such cases and positions as these the amateur carpenter must be content to confine his porch building to the back of his dwelling, and let the front alone.

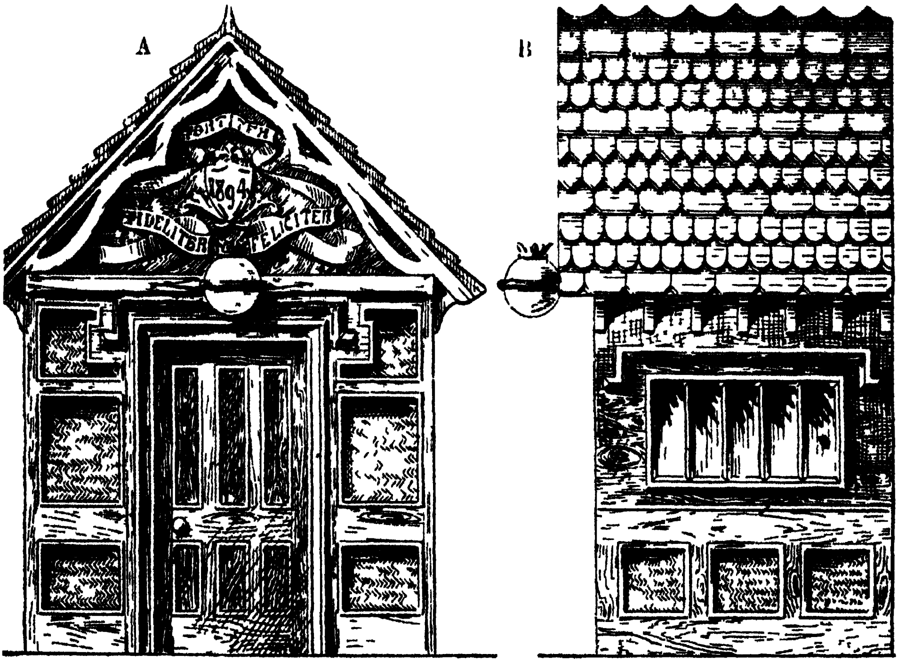


FIG 359. Design for a Porch shown in Front Elevation (A) and Side Elevation (B).

626. Now, in the face of all these points that demand consideration from every one who builds, or contemplates building, a porch, and which must be regarded in every porch that is built, and, further, taking into account the

numerous ways and styles in which porches may be built, and the exceeding great varieties of shapes and sizes in which they may be fashioned, how can I be expected to satisfy even a thousandth part of the number of those who, from reading this book, are enticed into porch building- by giving a number of alternative designs for porches that would satisfy every situation, and every peculiarity of circumstance? Now, the best thing I can do will be to generalise in this matter, and to forbear any attempt to write specially and specifically on any one kind of porch to the exclusion of all others. One thing, however, is open to me, and that is to give a sketch and description of a porch, which appears to me to be equally well suited, with a few trifling modifications in either case, for a gabled house, even were it Nathaniel Hawthorne's *House with the Seven Gables*, or a house of the time of the great Elizabeth, when the rigid lines that had hitherto prevailed in gables, began to be broken by curves and angular projections and mullioned windows.

Difficulties in building porches.

627. Accordingly, in Fig. 359 I have given a design for such a porch as I have been seeking to convey, in form and general principles, to the minds of my readers -a porch that may be made in almost any and every kind of material, whether it be the real article, or any imitation thereof. First of all it will be noticed that it is a closed porch ; that is to say, a porch furnished with a good solid door that may be locked, bolted, barred, and chained against all intruders. The porch may be built with or without a door, as it may suit the fancy of the builder. The chief objection to be urged against a door is that, as of necessity it opens inward, it partially renders one side of the porch useless ; for if it falls back on seats, the seat on the side towards which the door opens, or which is on the side of the hanging style, cannot be used for the purpose for which it has been placed there ; and if this porch is used for flowers, the flowers are hidden, and, being out of sight, are also out of mind.

Nature of porch: door.

628. As I have said, the house may be built of wood, or of any material which is possessed of greater solidity, and is therefore more enduring. It may be built of brick covered with stucco, having the mouldings formed of this material and the panels pargetted or rough cast, as is often done in houses built with timber beams-- half timbered, as it is called—in which case the intervening plaster work is whitewashed, and the beams are painted black. This style of house prevails in Cheshire; but a porch after this fashion would only be suitable for a half-timbered house. Secondly, the porch may be built of lath and plaster, and the mouldings formed of stucco;

Materials for building porch.

but this is a mode of dealing with it that I could in no way recommend. The primary object of the home carpenter is to build whatever he may be led to put up of wood; and we will now see what may be done to make the porch that is exhibited in Fig. 359 in wood, and to build it in such a way that all the features that are shown in the design given may be closely followed. The drawing itself is not made to scale, but its relative proportions may be easily determined. The width and depth are as 4 is to 3. If the doorway is taken to be 6 feet 6 inches high, the porch will be 6 feet wide and 6 feet deep. This is full large for any porch, too large indeed; so the home carpenter will have to make a working drawing, and, taking the principal features of the design, make his drawing in every part subservient to the space, etc., at his command.

Framing below roof.

629. As far as the framing is concerned, there will be no difficulty whatever, for so much has been said about this, that the wood worker will not have any trouble in dealing with it. It will consist of vertical standards, at the four corners of the porch and at the door posts, and transverse rails must be run between these when needful. For example, there must be a stout wallplate all round the top, into which the standards must be halved or mortised and tenoned: there must be a transverse rail above and below the windows at the sides; another midway between this and the bottom, where there must be a strong timber into which the uprights are tenoned, resting on a concrete foundation. Transverse rails must then be worked in at suitable positions on each side of the door posts, and the framing thus made must then be boarded over, preferably with grooved and tongued timber, but at all events, in such a way as to present a perfectly smooth and level exterior. As far as the roof is concerned, the rafters will be laid against a ridge board at the top, and notched so as to clip the upper arris of the wallplate, and they will project over and to some little distance below the wallplate as shown in the front elevation. The roofing material will be carried forward in front to overhang the door, as shown in the side elevation. The rafters may be four or seven in number, according to the size of the porch. Under each rafter a shaped bracket is put, as shown in Fig. 359, and on a larger scale in Fig. 360, with closer attention to detail. Thus the end of the rafter C is sawn up, and the notch cleared to admit the end of the bracket D, which is reduced at each side to the necessary extent, and the rafter is then screwed down to the bracket on

Roof: how constructed.

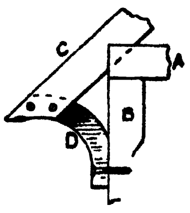


Fig. 360. Detail of Connection of Rafter and Bracket.

both sides. The other end of the bracket is screwed to the standard or boarding as the case may be. The rafter is notched on to the wallplate A as shown, and into this the standard B is tenoned. The rafters should first be covered in with thin boards, and on this the ornamental imitation of tiles should be placed, made and fixed as I have already described in a former chapter.

Tympanum. **Mouldings.**

630. The tympanum over the doorway may be fitted with standards from wallplate to rafter, and covered in with horizontal boards or with transverse rails from rafter to rafter, and covered in with vertical boards. It should present a perfectly smooth front, beyond which nothing should project but the shield which is fixed to it. The ribbon is painted, and on it I have placed the Latin words, *Fortiter*, *Fideliter*, *Feliciter*. These are to be seen over the entrance to the famous Hospice situate at the summit of the Pass of the Great St. Bernard on the Alps, and their full meaning in English, taken in their order, is, "Be of good courage, Be loyal (to Christ), Be cheerful". What better greeting can there be to the incomer to our dwelling? I know of none better. Attached to a facing screwed to the most prominent rafter, is a simple large board, cut in the form of a brace (⏞) used in printing. Lastly, the mouldings round door, windows and panels, and the latch above door and window are put on. These are V shaped, the point of the V projecting outwards, and in the labels they are surrounded by a narrow beading. If preferred, the mouldings round the panels may be defined with mopstick mouldings, but V mouldings are better. The faces of the panels may be roughened, as in wood carving. Had they been within the house I would have said, work them with Alabastine! but this material will not do for external work.

Window frame. **Ring for lamp.**

631. The frame of the window has already been made and put in, and this is mullioned, and fashioned to take five lights, consisting of single sheets of glass. It will be introduced between two transverse rails already mentioned, and surrounded by a moulding to conceal its juncture with the surrounding parts. I should paint it preferably in two shades of terra cotta, the roofing in alternative shades, and all prominent parts on the body of the porch in dark terra cotta, and the recessed parts in light terra cotta. The tympanum may be painted in light terra cotta, and the ribbon in cream and blue or green, relieved with gold, and the lettering in black. Nothing now remains but to make mention of the lamp, which, if it be round in form

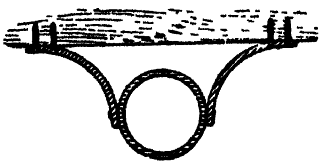


FIG. 361. Iron Ring for Lamp.

as drawn, should be set in a ring of iron secured to the wallplate by stays, as shown in Fig. 361. This must bring to an end my remarks on porches, and my description of the porch shown in Fig. 359,—made as short as possible it is true, but yet sufficient for every purpose, and occupying as much space as I can well assign to it.

632. Let us now turn to verandahs. The verandah has been described or defined as "a covered way, open on one side, surrounding, or partly surrounding a house, generally on the level of the ground floor". For "generally" the word "always" would be properly substituted; for when a covered way is made in front of windows on the first floor it becomes a balcony, and is no more a verandah. Taken as a whole, the verandah consists of nothing more than a light roof, projecting forward and sloping downward from the outside wall of a house, generally placed on the sunny side of a building. This light roof, which is often made of zinc painted green, is supported along its outer edge by posts or pillars of wood or iron. Sometimes these supports are broadened into a kind of trellis, to afford better support for roses and other climbers.

About verandahs.

633. As with the porch, the verandah: its character and mode of construction should in all cases accord with the construction of the house. If it will suit the house itself, a verandah in rustic carpentry always has a pretty and taking appearance. My readers, doubtless, will remember that I directed their attention in a special and pointed manner to the side of a porch in rustic carpentry in Fig. 356, which I said would do well as a design for the supports of a verandah in this style of work, because it furnished such a broad and ample support for climbers. And if the verandah were made of sawn timber many a design already given, especially those for work of Japanesque character, could be utilised for the purpose. The ends of the verandah can be left open or filled up according to the taste and wishes of the maker. If a cresting is required thrown forward from the wallplate and intended to mark this, or conceal the gutter behind it, the border edging shown in Fig. 350, but made in the way shown in Fig. 362, would look very well and in harmony with the structure. I should never attempt to make the roof of a verandah ornamental. The frontage and ends may be as ornamental as you please. If high enough, say 7 feet at the very least, put a rail from support to support, and below the

Construction and character of verandahs.

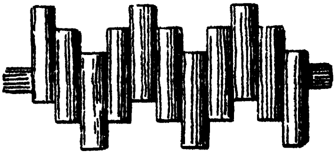


FIG. 362. Cornice for Verandah in Rustic Carpentry.

rail, two poles attached to the framing in such a way as to give the semblance of a depressed arch to the opening. The support afforded to climbers that reach the top of the supports and then turn off on either side will be found useful. If a couple of rustic seats are placed in the verandah, one on each side of the entrance, the verandah will be made to serve the purpose of a porch as well. Festoons of fir cones also make appropriate ornaments. For cresting for a verandah of more ambitious character those given in Fig. 240 and in other places would be appropriate.

Utilisation of verandahs.

Verandah as cool vinery.

634. But what we want to arrive at is this: how far verandahs can be redeemed from the simple purposes for which they were originally made, and so constructed as to be rendered useful for things which the original inventors of this adjunct to the house never for a moment contemplated: and this without interfering in any marked degree to the exclusion of air from the interior of the house. For example, a verandah may be easily converted, if wide enough, into a greenhouse or cool vinery; but I should not advise any attempt of this kind to be made if the width of the space which the roof covers be less than 4 feet; and if making one anew, endeavour to place the roadway, or space below the roof, at 6 feet if you can get it. I will give you the result of my experience in a matter of this kind, in relation to the house that —not Jack, but —Poor Old Uncle built. But here a simple sketch diagram is necessary, that you may understand the position. The back of the house had a direct south aspect, and was as hot as hot could be when the sun shone out in its vigour. The scullery door was at A, the kitchen window at B, looking down a cement space in front of the scullery that led to the dustbin; C was a door from the hall by which access to the garden was obtained, D was another door, E a French window in the dining-room, opening, before I commenced operations, on to the garden. As the dining-room was a very cold room in winter, a glazed door was placed at F, so that the space within might serve as a little conservatory, G was an open space arched over, from which we went on to a gravel path, and round by a small box-edged border M to a door which led into my workshop, through which there was always right-of-way to the front of the

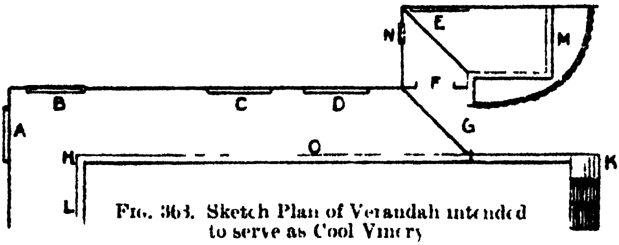


FIG. 363. Sketch Plan of Verandah intended to serve as Cool Vinery

house, and which served as a side entrance; L was a piece of trellis work that marked the scullery and all that pertained to it. The space from the wall of the house to the double line H K was above 5 feet. The first thing I did was to build a low brick wall from H to K, about 18 inches high. This was returned at K into a step-like terrace that flanked the border from L to the little terrace, and this was capped with three tiles 12 inches square, which, rising one above another, furnished a resting place for three large pots. I built another bit of wall within the border at M as shown. I have forgotten to say that at N was a small store room window. The wall served as a footing for a mopstick railing, made as shown in Fig. 349, and supports were planted in the wallplate on the brick wall from H to K, on which the roof rested. The supports at H and O were double supports, so made for a purpose that will appear presently. The roof was glazed after the manner of a greenhouse roof. Then came a hip at G, by which it was returned towards E; and then, as a matter of course, came a valley, and the roof, which was of the same width throughout, terminated at M; the end of the house, or the brick work, then being carried straight up to meet the end of the glazed roof.

635. So far so good. The reader will now wish to see a little more closely into the construction of the cool vinery; and for this purpose I give in Fig. 364 a sketch diagram of a little bit of it, not drawn to scale, but sufficiently clear to show construction. In this, A shows a support tenoned into the wallplate H on the brick work K, against which the border rose in a slope from the edge of the small lawn in front. The top of the post was further tenoned into the rail B, which acted as a support to the base of the glazed roof, and carried the gutter which ran round the vinery, below the roof, from one end to the other. The wallplate nailed to the wall of the house, which afforded a lodgment for the upper edge of the first tier of panes of glass, is shown at C. The bars, which extended from C to B, and which carried the panes of glass that formed the roof, are shown at D, D. Below B, and at a distance of 15 or 18 inches below it—I forget which—ran a rail F. Bars, shown at E, E, E, were inserted between B and F, and the space from end to end in front was glazed. At G is shown the capping of the mopstick railing, which was raised above the brick work H, H being the wallplate on top of the dwarf brick wall. This was nailed down at intervals to wooden bricks built into the top of the wall between the bricks to afford means for the attachment of the wallplate H. The vinery itself was lofty; the height from the cement floor within to the rail F being

Construction of cool vinery.

fully 6 feet. The object in putting glass between B and F was to collect as much heat as possible in the roof of the vinery. The object of the double support already mentioned was to afford a safe lodgment for the stem of the vine, which was brought up outside the vinery as far as the rail F, and then entered the house just below it. Lateral branches were then carried to right and left along B on its inner face, and from these, rods were carried up the roof at suitable intervals. These rods were about 6 feet in length; for, as the width within from B to the wall was just upon 5 feet, and the height of the wallplate at C about 4 feet above this level, in order to give a good slope, this would make the length of the bars available for training rods about 6 feet. I planted a Black Hamburgh vine at H, and a Foster's Seedling at G; and these bore very good grapes, the clusters being far larger and better ripened than any growing entirely without protection in the open air.

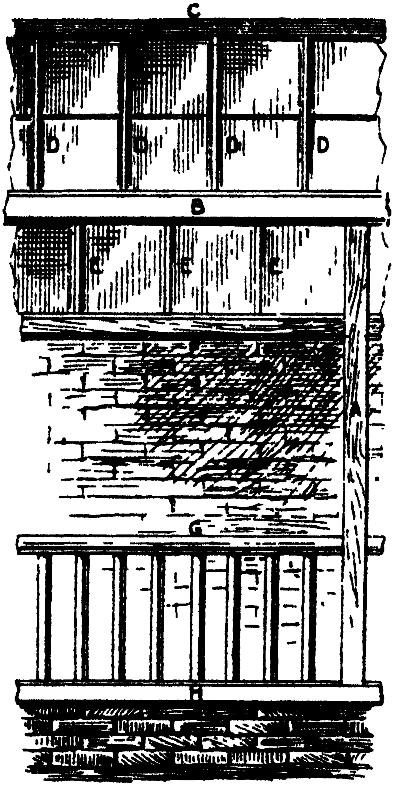
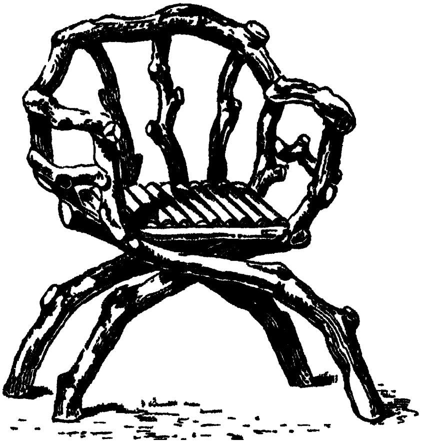


FIG. 364. Diagram exhibiting Construction of Cool Vinery in Front Elevation.

Suggestions for verandah greenhouses.

636. Now, in such a case as this, it is possible to do a great deal; and the transition from a cool vinery to a conservatory or small greenhouse is easily effected, by making the front solid from H to G, and glazing above this from G to F. Suppose, for example, a verandah 6 feet wide were formed along the front of a double-fronted house, with dining-room on one side, and drawing-room on the other. Then, by glazing up each end, or furnishing each extreme end with a glazed door, through which access may be obtained to the garden beyond, and leaving a space in front of the front door with a glazed door on either side, through which the greenhouses on each side may be entered at pleasure, the feat is at once accomplished of killing three birds with one stone; for we not only get three greenhouses, but we have a porch between them as well. With lights to

open in front at proper intervals, and suitable ventilators in the roof, there is no reason to suppose that the rooms within would be hot and stuffy in warm weather; and in winter, the greenhouses thus situated without the rooms, would act on the principle of double glazing to windows, resorted to in Russia and cold countries in Northern climes, and tend to keep the rooms warm and cosy; and as action is always followed by reaction, the warmth of the room within would tend to raise the temperature of the house, as long as gas and fires were alight, above the temperature without. But here I must stay my hand, and bring my remarks on the utilisation of verandahs to a close.



Rustic Chair.

CHAPTER X.

AVIARIES, GARDEN FRAMES, GREENHOUSES, SUMMER-HOUSES, AND TOOLHOUSES.

Structures without Connection with Dwelling House Foundations of Buildings intended to be Removable—Aviaries *versus* Cages—Ground Plan of Aviary—Skeleton Framing of Aviary—Modes of Constructing Frame Work Construction of Upright or Post of Aviary—Construction of Frames for Sides of Aviary—Annex to Aviary with Entrance Doors—Construction of the Roof - The Toolhouse: Its Size and Position - Movable Toolhouses—Construction of Parts—Interior Fittings—Guttering—Toolhouse in Corner—Summer-houses generally—Lining of Interior and Floor - Hexagonal Summer-house—Construction of Roof—Construction of Building—Details of Construction—Suggestions for Rectangular Summer-houses—Rectangular Summer-house in Rustic Carpentry—Rectangular Summer-house in Plain Carpentry -Garden Light: Dimensions—How skilled Carpenter would make Garden Light—Construction of Frame—Difference between "Light" and "Frame" Dimensions of Parts of Frame—Notching Parts together -Forming Shoulders to Notching - Completing the Jointing—Management of Overlays—Glazing, etc.—Sizes of Garden Frames—Construction of Garden Frame—Best Way of making Frame—Bearers for Lights and Grooves to carry off Water—Long Frames for Protection—Remarks on Cool Greenhouse and Vinery, etc.—Cool Greenhouse for Flower Culture—Back of House -Walling in Front - Framing in Front and at Sides—Construction of Front of House—Preparations for Roof—Rafters of Roof—Fitting and Fixing Rafters to Wallplates—Lights for Front and Sides—Floor and Interior Fittings—Span-roof Greenhouse, etc.—Distinction between Vinery and Cucumber House -Plan of Vinery—Ground Plan—Excavations for Foundations—Jamb for Doors—Framing round House—Ventilators in Graining: Rafters - Support for Ridgeboard—Wiring for training Vines and Cucumbers.

Structures without connection with dwelling house.

637. In this, the closing chapter of the Second Part of this volume, we have to consider the best modes of dealing with structures that *may be* in some way or another connected with the house itself, but which in ninety-nine cases out of a hundred would be entirely independent of it. Thus, an aviary or a greenhouse may be, and frequently is, connected with the house; but the connection will be carried out under certain conditions. It will, however, serve my purpose and the purpose of the home carpenter far better to regard them as separate and independent structures; and accordingly, as such I shall regard them and deal with them.

638. The home carpenter, I trust, will not have forgotten what I have said in an earlier part of this volume with reference to the method he must adopt in putting up any structure that he does not care to leave behind

him in a place that he does not own, but merely occupies as a tenant for a time, terminable at will either by himself or the owner. If he does not I will briefly remind him of it, as it will apply more or less to every structure mentioned in this chapter, except the garden frame. It is briefly this:—If it is intended to leave the structure behind for the benefit of the owner of the premises, and consequently of any future tenant, the framing of the structure may be connected with the ground to any extent to which you like to go; that is to say, the principal supports of the structure may be driven into the ground, or placed in holes dug for the purpose, and afterwards filled up round the posts with brickbats, stones, and rubbish tightly and closely rammed together. If, however, on the contrary, the structure is intended to be removable, it is best to make it a framed structure, bolted together, and resting on a foundation of brick work or concrete, which will be duly levelled, and must be left behind, whether you like it or not. On this substratum of brick work a second platform must be placed, formed of timbers halved together at their connection crossings, and securely bolted up; and then on this your framed building must be placed, and with it, for security's sake, it should be connected. As to the mode and method to be followed in effecting all this the reader will find it given in detail in page 282 *et seq.*, and to this I must refer him.

Foundations of buildings intended to be removable.

639. Now, as aviaries stand first on the list of subjects to be treated in this chapter, with aviaries will I begin. In putting up an aviary I think there are certain conditions always to be observed, and these are:—firstly, that they should always be constructed with means of protection from any quarter from which cold winds and heavy rains may happen to come; secondly, that such means of access to the interior shall be provided as may render the escape of any bird impossible, should the owner of the aviary desire to enter it at any time; and thirdly, that the form of structure should always be such as will render it ornamental, and an object calculated at once to attract and interest the eye of any visitor to the garden.

Aviaries versus cages.

640. Now, the first thing that will naturally suggest itself to any one who is thinking of building an aviary, is the plan on which it shall be built; and he will then begin to pass over in his mind what plans are open to him. It must of necessity be a regular building, and the ground plan must be that of a regular figure. Thus, it may be square in form, or a rectangular oblong, greater in its length than in its breadth; but although these forms may be

Ground plan of aviary.

Skeleton framing of aviary.

desirable under some circumstances of situation and position, neither seem to commend themselves as being ornamental as separate and independent structures; and thought then seems to point to one or other of the regular polygons as better calculated to meet the requirement of ornamental form; and of the pentagons, hexagons, and octagons, the last seems best calculated to draw forth Archimedes' exclamation of *Eureka*—"I have hit it". So the aviary whose construction I will now describe, shall be octagonal in form and ground plan; and having determined on this, I have given in Fig. 366 the ground plan of such an aviary, and in Fig. 365 the side elevation of the aviary, showing the kind and nature of the framing that will be required; and this, let me add, is, as all elevations of the kind should be, projected on and from the ground plan. In my ground plan and side elevation, I have placed the length of the side of the octagon at 4 feet, which is full large,--too large, if anything; but I am seeking rather to show the principle of construction, than to lay down any hard and fast size for the amateur to work by. This has the effect of making the framing appear dwarfed in height; but whatever may be the length of the side of the octagon, the height of the aviary should correspond with that of the skeleton framework shown in the plan, or at all events not less than 8 feet from ground rail to wallplate, which is 1 foot less than that which is indicated in Fig. 365.

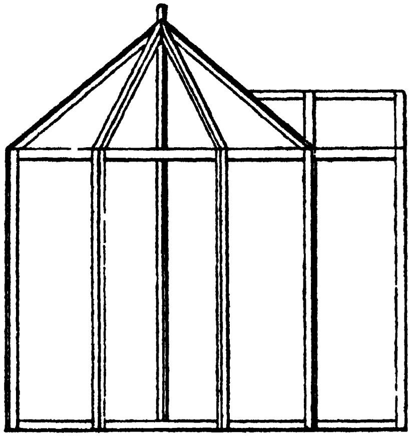


FIG. 365. Skeleton Projection of Framing of Octagonal Aviary.

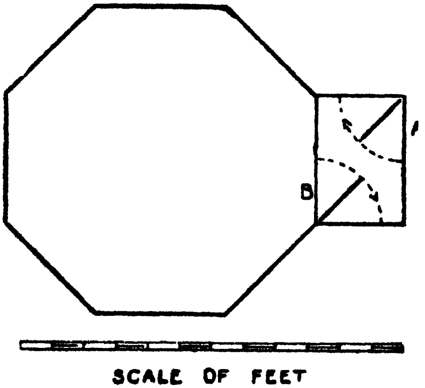


FIG. 366. Ground Plan of Octagonal Aviary with Annex as Entrance.

641. Now, as there is always much more trouble in making anything that is movable, than there is in putting up an erection that is to remain *in situ*, my recommendation to the amateur is to content himself with removing

the wire framing with which the sides of the aviary must be fitted, and to leave the skeleton and roof to the next comer, to be devoted by him to any purpose that he may think fit. If he wishes to make every portion of it movable, I have already shown him how he must do it. In either case, what I am going to say will be equally to the purpose, only if removable the eight uprights that are necessary must be tenoned into the groundplate below and the wallplate above; whereas, if unmovable, they may be let into the ground without any thought or care as to what is to become of them ultimately. There is, however, an alternative which will facilitate removal, although it has not occurred to me till the present moment, and that is to drop the uprights into sockets sunk into the earth to receive them, in just the same manner as movable clothes posts are dropped into their sockets while they are in use, and afterwards taken out and put by until they are wanted again. Now, whatever may be the mode of construction resolved on, the uprights had best be tolerably substantial in character, that is to say, of sawn stuff, from 2½ to 3 inches thick, and 2 inches in width. The sides of the aviary will consist of wooden frames, with wire netting tightly stretched upon them; and as it will be necessary to make these frames perfectly square, that is to say, without any bevel on the outer edge to fit the splay of the post, we must find some way of working the upright on each side, so that we may arrive at a rectangular rebate for the frame to drop into. An easy mode of managing this is shown in Fig. 367, in which A represents the section of a post 3 inches by 2 inches, placed in due position at the corner of one of the angles of the octagon, the adjacent sides meeting at the central line of the post on its outer edge. This diagram is drawn on a scale of ⅛ inch to 1 inch, so that it may be easily read. To mark the angle of the hexagon on each end of the post A, and then to draw a line with a marking gauge from point to point, thus obtained on each side, is a matter of no difficulty; and as a similar line down the outer face of these may be drawn in a similar manner, there will be no trouble involved in removing the arrises of the post at B and C down to the lines thus marked with jack plane and smoothing plane. The next thing to be done will be to get a piece of board 1¼ inches thick and about 2½ inches wide, or a trifle more, sawn from top to bottom, feather-edge fashion. This had better be done at the wood yard, and the pieces thus obtained will have to be nailed to the side of the post as shown at D and E, after the manner of cheeks.

Modes of constructing frame work.

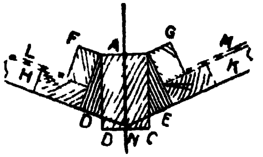


Fig. 367. Construction of Upright at corner of Aviary shown in Section.

Construction of uprights or post of aviary.

This will bring the faces of the post right and left of the central line nicely square; and in order to get our square rebate we have only to nail on stops about 1½ inches wide and 1 inch thick, in the manner shown at F and G, to get the rectangular rebate required. Into this the wire frames are dropped as shown at H and K, the frames being made of battens, 2 inches by 1 inch; L and M represent the wire netting strained across the frame.

Construction of frames for sides of aviary.

642. With this all difficulty in fashioning the standards to suit the frames at once vanishes; and all we now have to do is to place stops on the upper surface of the groundplate and lower surface of the wallplate, in such a way that a similar rebate may be formed, against which the upper and lower rail of the frames will butt and rest. We may as well now turn our attention to the method to be followed in making the frames. Now, as the distance from D to N measures 2 inches, it is manifest that in any aviary, built as I have described, the length of the rail will be just 4 inches less than the length of the side of the octagon, whatever that may be. Thus, if the side be 2 feet, the length of the rail will be 20 inches; if 2 feet 6 inches, 26 inches, and so on, whatever the height of the frame may be Now, for the sake of giving the utmost strength and stability to the frames, it is desirable to have three transverse rails between the top and bottom rail: one in the centre, and one midway between central and top rails, and another midway between central and bottom rails, or at the crest two intermediate rails, placed at equal distances from the top and bottom rails, and from each other. Both styles of the frame and the rails should be most accurately cut to length, and halved into one another at the proper places, and then left: nothing being done towards fixing them beyond putting the top and bottom rail in place to help in determining the quantity of wire netting required for wiring the frame. Gauge the inner sides of the styles to the width of 1 inch from the inner edge; and then put on the wire, first down one side, fixing the wire at intervals of 3 or 4 inches with the little staples used by bellhangers in fixing the wires of bells from the pull to the bell itself along the surfaces that it traverses; and then do the same on the other side, taking care that there is only just wire enough used in width and no more, in order to ensure proper tightness when the other rails are put in place. Then pull the styles apart as far as possible, and press the halved ends of the other styles into the notches made to receive them; and it will be found, through the pressure of the shoulders of the rails keeping the styles well apart at the proper and regular distance, the netting will be tightly and evenly strained from side to side. Then pull

the netting tight at top and bottom, fasten it down with staples, and the frame is finished. The wire netting itself may be cut to proper width and length with nippers, properly made for this purpose. No diagram, I think, is required in explanation.

643. Thus, the eight standards and the eight frames required for the body of the aviary are made, and should be completed before any more of the work is done. The construction of the groundplate will depend on the manner in which the home carpenter determines to build his aviary. The rose temple shown in Fig. 306 will supply a pretty pattern and form for any one who will take the trouble to construct an aviary in this form. The framing and frames constituting the annex shown to the right in Fig. 466, are similarly constructed. The reason why the aviary should be furnished with the annex is simply this. It enables us to furnish the aviary with double doors, and thus prevent the escape of any bird on the ingress or egress of the owner of the aviary. The door at A opens inward; and when the aviary is entered the door should be carefully closed before any attempt is made to open the door B. This opens outward, and should only be opened wide enough to allow the person who opens the door to slip in. Should any bird make its escape into the annex, it may be easily recaptured and restored to the aviary. If the sides of the aviary are very narrow, the doors must be made the whole extent of the side; and in this case it will be better to make the door A to open outward, and the door B to open inward. When all this has been done, the posts must be connected by a substantial wallplate, the parts of which are halved together at the corners, the tops of the standards entering the lower portion. The wallplate will form a stable basis on which to rest the rafters of the roof, which must form the next subject for our consideration in connection with the aviary.

Annex to aviary with entrance doors.

644. In forming this, it will be better to rear a thick post in the very centre of the aviary, against which the upper ends of the rafters may butt and rest. The rafters themselves should be at least 8 feet in length in an aviary of the size I have described, or, at all events, 12 inches longer than the distance between the wallplate and the central post, so that the eaves may project, and, in thus projecting, form a shelter to the inmates of the aviary from slanting rain. It is better and more picturesque to thatch the roof than to form it of wood, because thatch is warmer for the birds in winter and cooler in summer than a roof of wood, metal, or any other material. A perspective view of the roof thus finished, with eaves

Construction of roof.

overhanging the sides of the aviary by at least 12 inches, is shown in Fig. 368. The rafters should be of stout timbers, as stout as the posts, as they have to carry rails nailed to them transversely, on which to lay the thatch. The roof of the annex forms a little gable, projecting from the main roof. Rough poles, of the size of kidney-bean poles, put across from bar to corresponding bar of roof, and from wall-plate to wallplate, will form suitable roosting places for the birds. To the central post, branches of wood covered with lichen may be fastened, so that the birds may hop from one to another at will; and to the posts, brackets may be attached carrying bowls, in which the birds may nest, and build if mated, and if so disposed. The necessary food and water may be introduced through the doors. I have said nothing about painting, as this must depend mainly on the fancy and taste of the operator. Possibly, it would look well to paint the uprights and transverse parts of the framing of a good tint of brown, and to render the framing of the panels in white. I must not omit to say that the frames should, in all cases, be securely screwed to the stops, and the outer door at A kept padlocked. The builder must not content himself with battening in the frames; for this would enable any ill-disposed person to unfasten any one of them under cover of the night, and so give every tenant of the aviary the means of quitting it. In all such cases, and in all such structures as these, there is nothing like strict attention to the old saying, "Safe bind, safe find," which possesses a weight and value of which people in general do not think as much as they might and ought.

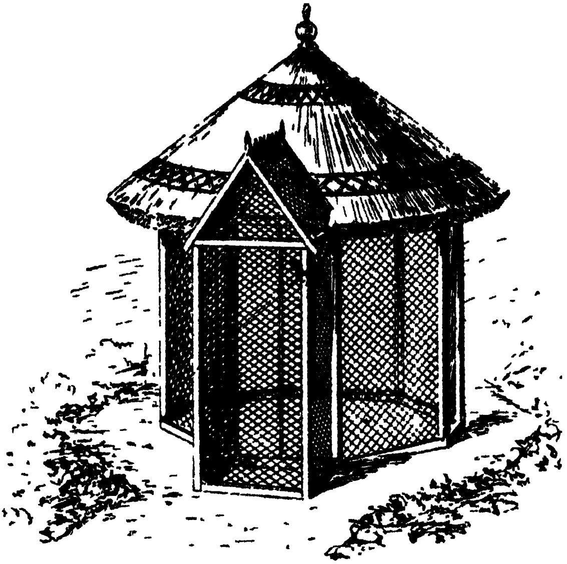


FIG. 368. Perspective View of Aviary complete, showing Thatched Roof and Annex for Entrance.

645. Although I have first dealt with aviaries in this chapter, I will take the rest of the subjects to be treated therein in inverted order of alpha-

betical precedence. This brings me to toolhouses, about which in reality there is not much to be said. The toolhouse, if it be possible to do so, should be kept out of sight, and in no way occupy a prominent position, being at the best but a small structure, from 4 to 6 feet square, and such as should be masked by shrubs and climbers, especially in a small garden, and when it cannot be hidden within or behind a shrubbery, which is the best place for it. In old gardens, generally speaking, a toolhouse will be found ready to hand. In gardens attached to modern houses, in which the owner or occupier desires to erect one, it will be rather a question of position, for the construction is simple enough. Taken broadly, and as comprehensively as may be, there are two points of view from which the toolhouse may be regarded, namely, as non-removable and removable; and the construction of non-removable toolhouses will depend upon position, and position only.

The toolhouse: its size and position.

646. Now, with regard to movable toolhouses, enough has been said in the preceding Chapter of this work (see page 504) on the construction of buildings that an occupier as tenant might be desirous of moving, to render the repetition of it here a mere waste of space. The method of foundation has been fully explained, and also the mode of constructing a building in sections, held together by bolts and nuts, or by screws, so that but a short time is needful either for taking it to pieces or putting the component parts together. In form and size, it need be no more than a structure about 4 feet square, consisting of back and front, both gabled, or assuming a triangular form at the top, the apex forming a right angle. The door should be in front, and need be no more than 2 feet wide, thus leaving a space of 12 inches on each side, *inclusive* of door frame. The door should be 6 feet in height, so that the height of the house itself from floor to top of sides, and top of lintel forming upper part of framing of door, need be no more than 6 feet 6 inches. As the width of the house is 4 feet, this enables us to determine at once the height from floor, or bottom of sill forming lower member of framing of door, as being 8 feet 6 inches, as it is manifest that the height of the apex of the rectangular gable above height of sides etc., will be just half the width, or 2 feet. The roof will consist of two parts about 4 feet 6 inches long, and 3 feet wide, so as to overhang the structure, before, behind, and at the sides, to an extent of about 3 inches. The junction of the two parts of the roof, from gable apex to gable apex, will be rendered water tight by the superposition of an independent roof ridge of sufficient width, bolted down to the framing of the roof pieces. I say *bolted down*,

Movable toolhouses.

because the heads of the bolts will be on the outside, and the threaded ends and nuts thereon within; and these will be taken apart easier than screws could be removed, which must be put in from above, and which, in time, would get rusted into the wood by the action of the weather.

Construction of parts.

647. As to the construction of front, back, sides and top, it will rest entirely with the maker, whether they shall be constructed of weather boarding which is disposed horizontally, and is thicker at the bottom than at the top or of boards of the same thickness throughout, disposed vertically, having the joints covered and hidden by slips nailed over them. Both forms of construction have been already explained; but it will be as well to remind the reader, that in feather-edged board work, suitable provision must be made to exclude the weather at the corners of the building. This is shown in Fig. 369, which affords a sectional view of the method to be adopted; in this A represents the quartering 2 inches square or thereabouts of which the frame work is constructed; B is a slip 1 inch square, and C another slip, 2 inches by 1 inch, *nailed* to A. The ends of the weather boarding shown at about half its thickness must be *screwed* into the rebates thus formed, the screws being well greased before insertion, so that they may be the easier drawn when necessary. The weather boarding itself must be held together at the ends by pieces of batten similar to that shown at C, which will fall into notches cut in any transverse bars of the framing, the ends of which will be notched into the uprights; or, what will do equally well and perhaps better, the uprights of the quartering at the corners may be connected by transverse rails of battens 2 inches by 1 inch, against which the battens connecting edges of weather boarding, which may now be continuous from top to bottom, will butt, and to which the transverse rails may be screwed at the points of contact. There need never be any window in a tool house.

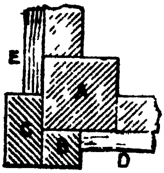


FIG. 369. Mode of rendering Corners of Weather-Boarded Building Weather Proof

Interior fittings.

648. There is no necessity for any illustration of the tool house described, so simple is it in form and construction; and any home carpenter will be, or should be, capable of making a drawing to scale for himself. With regard to interior fittings, rails should be placed at the sides on either side of the door, and a slip nailed across the bottom all on cleats, attached to the front and back for the purpose; so that the ordinary tools may be stood upright in the two racks thus formed, like umbrellas in an umbrella stand. At the back and sides too, for there will be plenty of head-

way above the tools, shelves should be placed on which seeds or any other thing may be placed. *Above* the shelf at the back provision should be made for slinging the scythe, and its bent "snath" or handle, which should be kept apart when the scythe is put by for the winter. Hooks should be screwed in under the shelf against the boarding from which the sickle or swap hook, garden shears, bill, hammer, and other tools of the kind used in the garden should be suspended. The same kind of internal fitting is desirable for all tool houses, whether removable or not.

649. Now with regard to tool houses that are not removable, their construction will be affected by position only. The mode of construction may in all cases be much the same as that adopted for movable houses. If it be found necessary to construct a tool house in an existing shrubbery, it may be incumbent on the builder to construct as an entirely independent building, the corner posts of which will be let into the ground and form the principal parts into which the transverse pieces will be notched, or it may be built with its back against a wall or fence, in which case, if the fence be solid after the manner of a wall and of sufficient height, sides and front will be all that is required. In such a case as this, it will be as well to make the front 7 feet in height, and to make the roof flattish, having a fall of, say, 18 inches from back to front. A piece of guttering should be placed in front above the door, and the water from this should be carried into a shoot fixed to the side of the house, and returned against the wall or fence, by a short arm about 18 inches long, which would throw the water clear of the tool house, and so prevent any soakage close to the house that might cause damp within it, or, better still, it might be received into a large cask with a wooden top to it, and so utilised for the garden. Garden crops suffer severely in long periods of drought, and every care should be taken, by means of casks and tanks below ground, to save and husband rain water for garden use.

Guttering.

650. In a small garden the best position for a tool house will be found in a corner, formed by the meeting of two walls or fences at right angles; and if it be a shady corner with a northern aspect, there will be all the less regret in appropriating it to this object. If the walls or fences are not high enough, they must be raised to the necessary height. If the fences are not solid, they must be rendered so by the attachment of rough slab wood work nailed to them from within. Nothing more than a front, one side and sloping roof will be required. The roof should slope to the side, and the front, which will have the door in it, will assume the form at top of a semi-gable. If it is to be masked with shrubs, thus forming a small shrubbery

Tool house in corner.

round it, or if trellised with wood or wire to admit of the attachment and training of climbers, it may be made as plain in the exterior as possible; but if it is permitted to remain exposed to view without shrubs or climbers, the front and side should be constructed in ornamental wood work, in imitation of wood blocks with narrow spaces surrounding them, or of tiles, such as the fish-scale tiles and other ornamental tiles already described in another part of this volume. And with this all comment and instruction on tool houses may be closed.

651. Similarly, summer houses may be treated and dismissed in comparatively few sections; for all that has been said about porches and verandahs may be used and utilised for the construction of summer houses, from a simple shelter above a garden seat to those of more elaborate construction.

Summer houses generally.

Moreover, the mode of construction in rustic carpentry, which is most appropriate for summer houses, has been entered into so much in detail that its repetition is unnecessary here. A summer house should be as far away from the house as possible, and I think it desirable that the back and sides of every structure of this kind should be battened and lined with Russian matting, known to gardeners as "bast," confined at top, bottom, sides and angles with lengths of mopstick from ½ inch to ⅝ inch in diameter. If kept well brushed, clean, and dry, it forms a serviceable and appropriate lining. If the home carpenter has sufficient skill to make a floor of wood in regularly shaped blocks of any form after the manner of parquetry and disposed and fitted together in a regular manner, so much the better; but if he cannot accomplish this he may construct it of rough billets, formed by sawing oak boughs, and other kinds of trees, into pieces from 6 to 9 inches long, a suitable kerb having been placed round the edge of the space it is intended to cover, consisting of stout boarding from 1 inch to 1½ inches in thickness. The first series of larger blocks having been packed as tightly as possible, the interstices between them may be filled with blocks cut from smaller boughs, and driven in like pegs, after having been slightly sharpened at the ends. Finally, sand or very fine gravel may be spread over the floor and well brushed into the smaller interstices that remain; and the result will be a good solid floor, which being formed chiefly of wood, which is a bad conductor of heat and cold, will always present a warm and comfortable feeling to the feet of those who sit in it, who will not catch cold from contact with it, however damp may be the ground and grass without the summer house.

Lining of interior and floor.

652. In Fig. 370 a pretty design for a summer house is given, with plan

in Fig. 371, and sectional diagram showing construction in Fig. 372. It has been given in *Every Man His Own Mechanic;* but it will bear repetition here on account of its pretty appearance, and the excellence and appropriateness of the style and method of construction. It may be made open as represented, or the sides may be closed at back and glazed on each side of the door. If any of the family are disposed to be delicate, it will be better to adopt the closed form, especially if the lining of "bast," or Russian matting already recommended, be placed above the seats. If the home carpenter cannot make a roof of thatch as represented, he must obtain the aid of a regular thatcher; or, if he determine to make it of wood, he may do so, causing the rafters, whose outer edges will project beyond the wallplate, to meet in a central block surmounted by an ornament as shown, and cover it in with felt, overlapping at the joints in each direction over the junction of the roofing boards, and secured by slips of wood nailed on above the felt, and thus securely fastened to the roofing boards within. The construction of the floor of summer houses has been already explained above, and nothing more need be added here on this point.

Hexagonal summer house.

Construction of roof

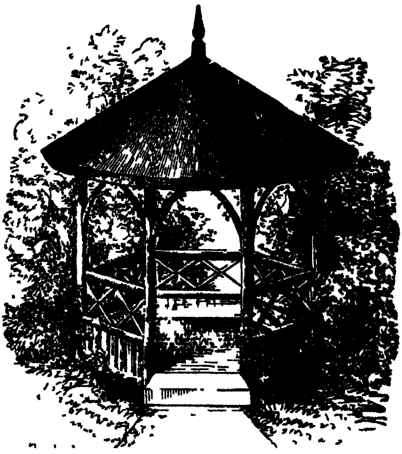


FIG. 370 Design for an Hexagonal Summer House.

653. As a matter of course such a summer house as the one now under consideration may be octagonal or hexagonal in form, as the builder may determine; but in either form the mode of procedure is the same. Let us, however, keep to the hexagonal form here. The first thing to be done will be to mark out a regular hexagon, and at each angle to sink in the earth a stout pole, either with the bark left on, if of fir, or better without bark, as the bark is sure to become loosened, and thus afford a retreat and lurking place for earwigs and other objectionable insects. When the posts have been well rammed, let in blocks of wood, hollowed at the ends on the outer edges,

Construction of building.

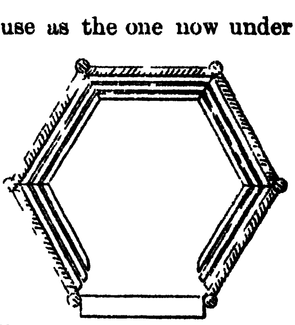


FIG 371. Plan of Hexagonal Summer House, showing formation of Seat.

so as to fit to each other, and to the posts. These should be about 6 inches wide. I have said nothing about the width of the sides, but from 2 feet 6 inches to 3 feet will be found sufficient—the narrower width being quite enough for an octagonal house. The ends of the blocks should be nailed to the posts with long spike nails. A broader piece may be placed between the posts that form the entrance, as shown in Fig. 371; and this will serve to make a step at the entrance to the building. These blocks will form a kerb for the flooring within; but this should not be made until the uprights are put in opposite the posts at the angles to support the front of the seats. The tops of the posts must then be cut to the same height, and a strong wallplate nailed from post to post to carry the rafters and the roof.

Details of construction.

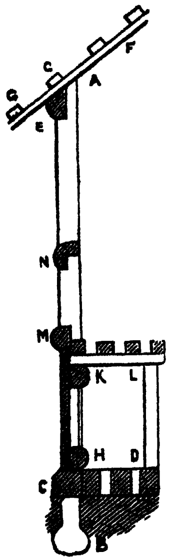


Fig. 372. Sectional Diagram, showing construction of Summer House.

654. The construction of the open form of summer house will be best understood from Fig. 372, and from this the construction of the closed form with glazed openings in front on each side of the entrance may be easily deduced. In this, A, B is a post of the building; C, section of block let in between the posts, as described above; E, the wallplate above; F, a rafter; and G, G, transverse pieces nailed from rafter to rafter to support the thatch, if thatching be resorted to for the roof. The rafters, as already explained, are all butted against, and nailed to, a hexagonal block at top. Notched into the pillars, and resting on the block C, is a cleat H firmly nailed to both. Another cleat K is notched in above in the same way, about 14 or 15 inches above the level of the floor D. This cleat serves to sustain the rails as at L, which rest in front on an upright, and sustain other rails parallel to the sides of the building which form the seats. The building below is closed in with posts of fir, or any other straight timber, sawn in half, and nailed to the cleats on the rails H, K. Similar half pieces are notched into the posts, as shown at M and N, and to these, pieces are nailed which form the rough and open lattice work at the sides above the seat. The rail at N is better made of a piece of pole of the required length, not sawn in two, but worked out at the ends and centre in the manner shown in section in Fig. 373, to receive the upper ends of the lattice work below, which would then be nailed to the vertical part A. If the builder determine on using close lattice work, instead of the very open arrangement shown in Fig.

370, it will be as well to work out the hollow throughout the whole length, or, to save the labour of working, to saw the pole in half, and the lower part in half again, as shown at A; and then to nail the lower part A to the upper part, which forms a capping to the lattice work. The cross bars as shown, and, indeed, close lattice work of stout bars, will look all the better if halved into one another. If the home carpenter determine on closing up the sides of the house as already suggested, the entrance only being excepted, he will find no difficulty whatever if he will refer to the instructions already given on work of this kind in previous parts of this volume.

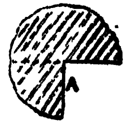


FIG. 373. Mode of treating Rail above Lattice Work.

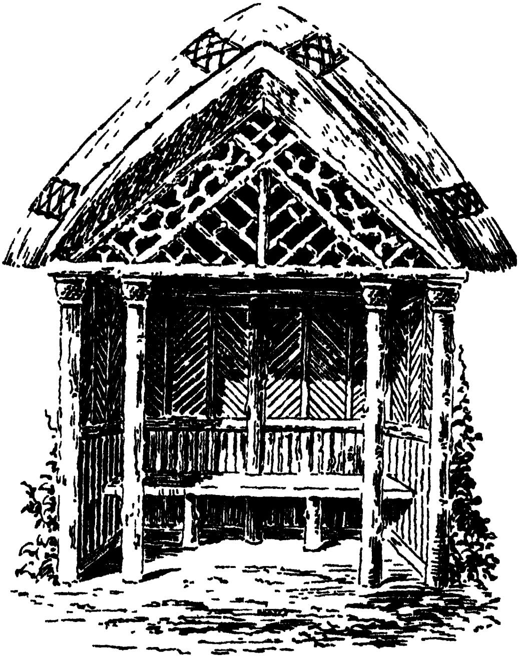


FIG. 374 Sketch View of Front Elevation of Summer House in Rustic Carpentry, showing Interior.

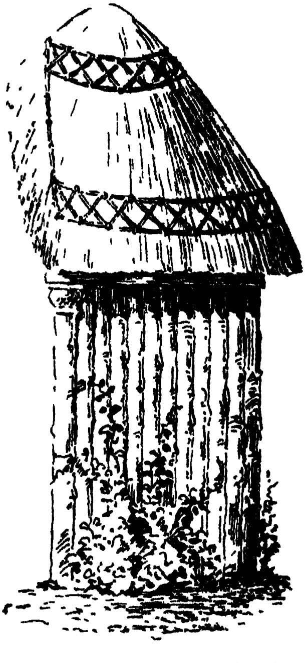


FIG. 375. Sketch View of Side Elevation of Summer House in Rustic Carpentry, showing form of Thatched Roof.

Suggestions for rectangular summer houses.

655. In case the home carpenter should wish for a building more simple in form, and, therefore, more simple in construction, I have given him in Figs. 372 to 379 sketch views of front elevation, side elevation and ground plan of two summer houses of rectangular form that speak for themselves, and present no difficulty in point of construction. Of these, one is in rustic carpentry, and the other in plain carpentry. The

former is suggested by designs supplied by Mr. Arthur Yorke, the latter by designs from the pencil of Mr. J. Moody, both of whom were valued contributors to *Amateur Work* when under my editorship. I will add a few words on each.

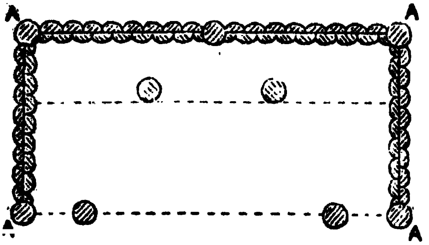


FIG. 376. Ground Plan of Summer House in Rustic Carpentry.

656. In Figs. 374, 375, and 376, suggestions are offered for the erection of a rectangular summer house in rustic carpentry, a style of building in wood with which the home carpenter may now be supposed to be thoroughly familiar. It will be helpful, however, if I say a few words with reference to possible dimensions; and in building a house of this description, the length may be assumed to be 8 feet, the breadth 4 feet, and the height to wall-plate 6 feet. The home carpenter may vary length and breadth to meet his particular requirements, but on no account should he attempt to reduce the

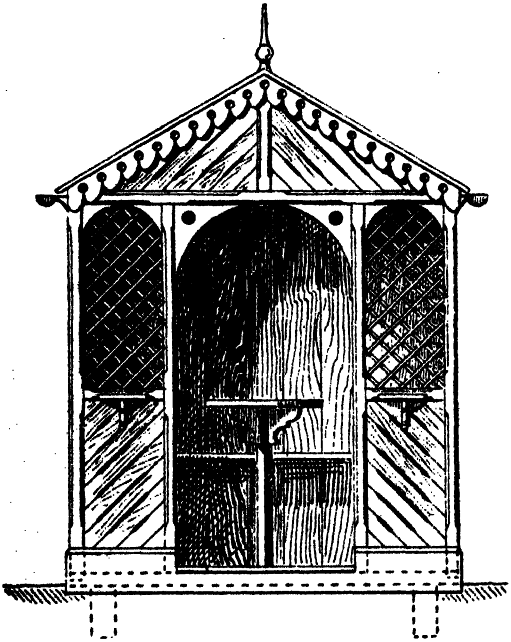


FIG. 377. Sketch View of Front Elevation of Summer House in Plain Carpentry, showing Interior.

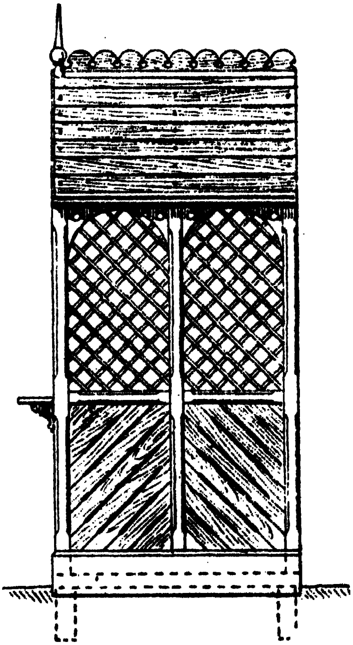


FIG. 378. Sketch View of Side Elevation of Summer House in Plain Carpentry, showing formation of Roof.

height. Of course, such a house as this will present a more picturesque appearance if surmounted by a thatched roof, as shown in Figs. 374, 375; but if sawn poles or a rough trellis be substituted for the open work of the tympanum in oak bangles above the wallplate in front, there is no reason why the roof should not be formed of rough slabs, well jointed and running down sides of roof from roof ridge to eaves, covered in with rough fir poles, sawn in half, also disposed longitudinally, and firmly nailed to the actual weatherproof roof of thick slab boards below them.

Rectangular summer houses in plain carpentry.

657. With reference to the rectangular summer house in plain carpentry, which is exhibited in front elevation, side elevation, and plan in Figs. 377, 378, and 379, this is less pretentious in character, easier to build and better adapted in every way for the wood worker whose lot is cast in the suburbs of any city or town large or small. With regard to dimensions it is supposed to be 5 feet 6 inches in length by 3 feet 6 inches in breadth, and it should not be less than 6 feet clear from floor to wallplate. As shown in the illustrations of front and side, four stout blocks of timber, or, better, a course of bricks, are first let into or laid on the ground, and on these the ground plate shown in Fig. 379, on which the superstructure is based and reared, is first laid. If posts or wooden sleepers are used, the ground plate must be bolted down to them; if bricks, it should be bolted down to wood bricks set in suitable places in the top course of brick work below. The rest of the work, namely, the construction of the framing of uprights, transverse rails and wallplate, will be easy enough, and the insertion of the tenoned ends of the uprights in the mortises prepared for them in the ground plate. The filling in of the panels below in front, and at sides with V-jointed boarding, and the openings above with trellis work, the boarding up of the back with plain boards vertically disposed, the placing of rafters of roof and formation of roof, of feather-edged boards, or in imitation of tiles, etc., as already described, are simple enough, and need no remarks or instructions in detail on my part.

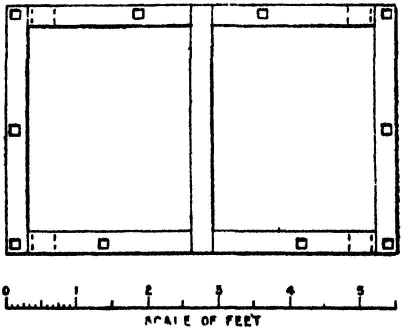


FIG. 379. Plan of Ground Plate of Summer House in Plain Carpentry, showing Dimensions.

658. We now come to the last of the subjects to be treated in this Part of *Home Carpentry for Every Man*, namely, greenhouse construction; and

here, it is above all things needful that the amateur wood worker should first understand how to make a "garden light" in the simplest and easiest possible way. When he can manage this, I can soon show him how to make the knowledge he has gained, available in doing the three things that are mostly required in the garden at home—namely, the garden frame for placing over the ordinary hot-bed, a cool greenhouse, and a vinery. The dimensions of a so-called garden light of full size is usually 6 feet by 4 feet; and we will now go step by step through the mode of making a light of this size, as when the home carpenter can do this, he can do anything, be it what it may, in greenhouse construction; for, after all, the principle of the garden light is that on which greenhouse construction is chiefly based.

Garden light: dimensions.

How skilled carpenter would make garden light

659. We will make our garden light 6 feet by 4 feet over all; that is to say, measuring exactly 6 feet from the upper edge of the top rail to the lower edge of the bottom rail, and exactly 4 feet from the outer edge of one side to the outer edge of the other. It is almost needless to say that I am not going to describe the making of the garden light in the manner in which the skilled professional carpenter would make it; but I may as well state here, as briefly as possible, the way in which he would carry out the work. He would first of all cut out side pieces—let us call them styles for brevity's sake—of the proper length and width; a top rail of the same width and thickness, but only two-thirds the length, or a little more, and a broader rail than the top rail and of the same length, but less in thickness by about ⅜ inch; and then he would plane these up, and tenon the rails at top and bottom into the styles, cutting his work, so that these parts when fitted together would make a frame of the exact dimensions required. He would then mark the inside edges of the styles and top rail to the extent necessary to form rebate, say, ⅜ inch wide, and the same in depth for the reception of the glass; and possibly he would limit the width of the rebate to ¼ inch in width, making the rebate ¼ inch wide and ⅜ inch deep, instead of ⅜ inch square in section. He would then notch and tenon two, or, far better, three longitudinal bars of the same thickness as the styles and top rail, and from 1 inch to 1¼ inches wide, into the top and bottom rails at regular distances, cutting these bars of such a length that the bottom end might enter the broad rail to some depth. He would form a rebate on each side of the upper surface of these bars, as in the sides of the style and lower edge of top rail. He would then glue up all the tenons and knock all the pieces tightly together, wedging up the ends of

the top and bottom rails, where they entered the mortises cut in the styles for their reception; and he would then strengthen the frame by turning it over, notching the styles and intermediate bars with notches, 1 inch in width and $\frac{1}{8}$ inch deep, making the notches exactly midway between the bottom edge of top rail and top edge of bottom rail; and into these notches he would drop a transverse flat iron bar, 1 inch wide and $\frac{1}{8}$ inch thick, which has the effect of imparting additional stiffness and rigidity to the frame. Lastly, he would drill holes in the bar at the proper places, countersinking the holes, so that he may securely screw the bar to the wood work; and he would finish his work by screwing on a bow-shaped iron handle to the centre of the upper and outer edge of the top rail, to enable the gardener to raise the light, and with greater ease draw it up and down the parts of the frame on which it rests. The carpenter's part of the work is now done; and, if he pleases, the amateur wood worker may buy frames for garden lights in this stage from the greenhouse builder, and paint and glaze them himself. Otherwise, the frame thus made by the carpenter is passed on to the painter and glazier, who completes the work.

660. Now, a skilled amateur could readily and easily make a frame for a garden light from the above description; but the unskilled wood worker would like to proceed in a simpler way, better suited to his powers. How to do this I am now going to show him; and I will promise him that when our frame is made, and properly painted and glazed, the resultant garden light will be distinguishable with difficulty, if distinguishable at all, from that which has been made in the regular way followed by the professional. To any one who is accustomed to my way of going to work in such cases as these, it is likely enough that a glance at Fig. 381 will reveal the secret; and he will see at once that I shall resort to my old but useful system of mocking. In point of fact, my frame consists of two parts, a substructure and a superstructure; and these are, or ought to be, so securely fastened together as to present the appearance of being one solid piece. The plan of the frame is exhibited in Fig. 380, which is given here on a scale of $\frac{3}{4}$ inch to 1 foot. I am sorry that I could not make the scale larger, but the size of page did not admit of this. With regard to the dimensions of the various parts of the frame, let us first bear in mind that we are making the frame of a garden light of the ordinary size, namely, 6 feet by 4 feet; that is to say, 6 feet over all, from upper edge of top rail to lower edge of bottom rail, and 4 feet over all from outer edge of one style to outer edge of the other. With regard to the

Construction of frame.

Difference between "light" and "frame".

parts of which the frame is composed, or, rather, let me speak of it for the time to come as *light*, because, strictly speaking, the term *frame* is applied to the box-like enclosure in which cucumbers or any other plants are grown, or forced by the action of the heat given out by the hot-bed on which the frame rests; and the term *light* to the framing by which it is covered in when brought to the status of a light by suitable painting and glazing. One

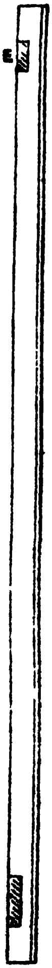


Fig. 381

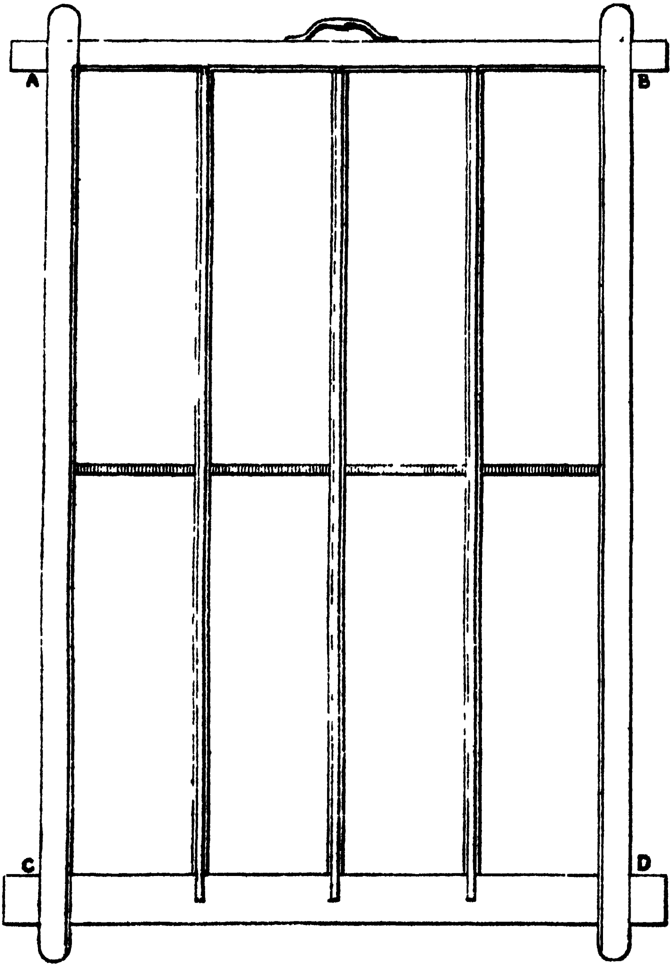


Fig. 380.

Fig. 380 Frame for Garden Light, 6 feet by 4 feet, in Plan exhibiting Construction Fig 381. Side Elevation of Frame Scale, ⅜ inch to 1 foot.

cannot be too particular in avoiding confusion of terms, and hence my apology for having been as precise and exact in my present explanation.

Dimensions of parts of frame.

661. To return, however, to the point which the preceding digression induced me to drop *pro tem.* With regard to the parts of which the frame is composed, or of which it seems to be composed when viewed as a solid piece of construction, there are two side pieces or styles, 6 feet 6 inches long, 2½ inches wide and 2 inches thick, one top rail of the same width and thickness, and 4 feet 6 inches in length, one bottom rail of the same length, but 4 inches in width and 1⅞ inches thick, and three intermediate bars intervening between the styles 6 feet long, 1¼ inches wide and 2 inches thick. Thus far for *apparent* thickness; but as we do not wish to have the trouble of making rebates in the solid wood, and intend to form them by mocking our styles, top rail and bars, though corresponding to the dimensions just given in length and width, will all be 1⅞ inches in thickness, which, the home carpenter will remember, is the exact thickness of the bottom rail. The dimensions given, moreover, should be the dimensions of the parts when they have been planed up and gauged for accuracy of width. When this has been done and all parts of the substructure are ready, we may take the necessary steps for putting the framing together, taking care to be absolutely correct in our measurements and scrupulously exact in marking out, with square and fine pencil or old knife, the places at which any cutting and clearing is to be done.

Notching parts together.

662. Our first aim, then, will be to halve the outer members of the framing together at A, B, C, D; and as our pieces have been cut of sufficient length, we shall have projections, or "horns" extending beyond the exact length of the various parts to the extent of 3 inches. Of these, the horns of the side pieces or styles will be permanent, and be rounded off in the manner shown in Fig. 380, but the horns of the top and bottom rails will be cut away as soon as the framing is finished. Let the saw kerfs be made with a fine tenon saw, and take care that in all parts the saw cuts are so made that the pencilled marks are still left showing, for this ensures perfect accuracy of fit in the jointing. The halving is shown at E in Fig. 381. Similarly the intermediate bars must be halved for the whole width of the rails, into the top rail and the bottom rail, the halving in all cases being so managed that the junction is made in the *lower* surface of the styles and rails, so as not to affect in any way the appearance of solidity above. The bars intervening between the styles will have to be set at regular intervals, and in order to arrive at the correct distance between each bar and

the styles, we may resort to a process of calculation to which we have had recourse before. The width over all from outer edge to outer edge of the styles is 4 feet, or 48 inches, and the aggregate width of styles and bars is 2½″ + 1¼″ + 1¼″ + 1¼″ + 2½″ - 8¾ inches; therefore, the aggregate width of the spaces, four in number, already alluded to, will be 48″ − 8¾″ = 39¼ inches; and the fourth of this is $9\frac{13}{16}$ inch.

Forming shoulders to notching.

663. I have said nothing about the necessity of using the marking gauge to ensure accuracy of depth in halving and notching the parts together; for I have mentioned this so often, that to many it will appear to be altogether superfluous. It is needful, however, in all good work. Nor have I reiterated my instructions with regard to clearing the notches, or rather finishing the clearing with a router set accurately to depth, a procedure which ensures close fittings of the parts. I am sure, however, that no conscientious home carpenter would neglect these duties, and my present remarks will be a timely reminder. There is one point in construction, nevertheless, to which I do not remember to have called attention before, and that is, when connecting parts at right angles to admit the rail or bar that is notched into the other, to penetrate the principal into which it is notched to the depth of just ¼ inch or ⅜ inch, by making a ruck or notch of that depth into the principal to receive the end of the subordinate. It is then just the lightly shaded part only of the end of the subordinate as shown in Fig. 381, that is *halved* into the principal, the smaller shoulder entering to the full extent of its width and thickness.

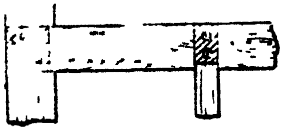


Fig. 382 Formation of Shoulder to Notched Work.

Completing the jointing.

664. When it has been ascertained that the various parts have been fitted accurately, take the framing to pieces, and paint all the joints with thick white paint plentifully laid on, then put the parts together again, knock them up close and tight, and then screw them tightly together from *below*, or from the *under surface*, as shown in Fig. 381. The putting the parts together with slight shoulders imparts greater rigidity to the whole structure, and aids very much, or should do so when correctly done, in the maintenance of rectangularity of fitting. The substructure is now complete, and nothing now remains but to turn our attention to the superstructure, overlay or mocking, call it which you will.

665. This overlay, it will be remembered, is necessary to form the rebate into which the glass is to be laid. We have provided for a rebate ⅜ inch in depth; but the home carpenter may please himself as to whether he will make

the width of the rebate ¼ inch or ⅜ inch. The former is sufficient, but perhaps the latter will be safer for the amateur wood worker, so let us take it at ⅜ inch. We must prepare two slips 6 feet 6 inches long, 2⅛ inches wide, and ⅜ inch thick, as overlays for the styles, one strip of the same width and thickness, and 43¾ inches long, or a little longer to allow for cutting to fit, to go on the top rail, and three slips 68 or 69 inches long, and ½ inch wide, to run down the centres longitudinally of the intermediate bars. This length is needful to allow them to run over and rest on the bottom rail, as shown in Fig. 380, so that there may be a holding for that portion of the glass which laps over and rests on the bottom rail. Paint over the upper surface of the framing, and then put on the overlays accurately and brad them down, punching in the heads of the brads. Do not be sparing in the use of brads. The next step will be to make shallow notches in the under surface of the styles and intermediate bars 1 inch wide and ⅛ inch deep for the reception of the iron transverse bar, which must be drilled and countersunk for screws, and screwed down. The last thing to be done is to screw on the iron bow handle to the outer edge of the top rail as shown in Fig. 380. The width of the glass for glazing will be $9\frac{13}{16}'' + \frac{3}{8}'' + \frac{3}{8}'' = 10\frac{9}{16}$ inches, but it will be wide enough if cut 10½ inches wide, to ensure its falling in the rebate without trouble. Give the framing two or three coats of good paint first of all, then press putty into the rebates, and press the glass well into it, so as to bed it firmly, beginning from the bottom. Do not have more than three panes - two are better because dirt always accumulates at the overlaps. Secure the glass in place by brads put in at intervals. Put no more putty into the rebate, but paint the edge of the glass in the rebate carefully, taking care to keep the edge of the painted line straight, and not to let the brush stray over the glass beyond the edge, as this causes undue disfigurement, which must be removed by wiping off the overplus with flannel or rag dipped in turpentine, passing it along the edge of a straightedge placed to coincide with the edge of the rebate. Glass technically known as 21 oz. glass should be used. The *light* is now complete and ready for use.

Management of overlays.

Glazing, etc.

Sizes of garden frames.

666. The next thing to be taken into consideration is the construction of the garden frame. Now, as the garden light, as we have already seen, is exactly 6 feet by 4 feet, the smallest frame that can be made, namely, a one-light frame, will also be 6 feet by 4 feet over all from outer edge to outer edge of front and back, and the two sides respectively; and we may therefore say, generally, that a two-light frame will be 6 feet by 8 feet from side to side, and a three-light frame 6 feet by 12 feet from side to

side. Actually, and in practice, however, the two-light frame will be 8 feet 1 inch over all from side to side, and the three-light frame 12 feet 2 inches from side to side, to allow for the width of the ridge or slip of wood which must be screwed to the runners on which the lights slide up and down, to separate the lights, and form suitable grooves for the lights to work in. In Fig. 383 an illustration is given of a two-light frame, which will make my meaning as to width from side to side over all perfectly clear, and which is sufficiently plain in detail to enable any intelligent home carpenter to build either a one-light, two-light or three-light frame without working drawings to scale figured here. I shall give him instructions as to dimensions and method of construction, and he will be very well able to make from these, working drawings to scale for his own special use and guidance.

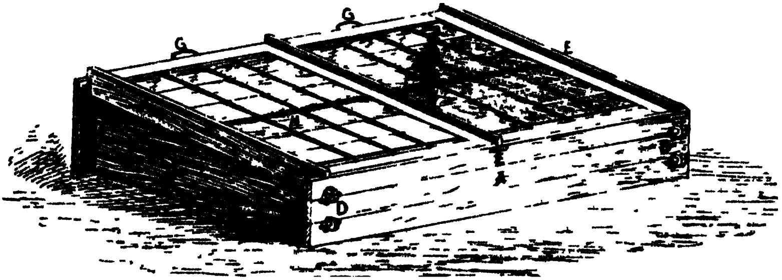


FIG. 383. A Two-Light Garden Frame in Isometrical Perspective

Construction of garden frame.

667. In all garden frames the general principle is the same, whether they be large or small; that is to say, the back is always higher than the front, and if possible they should be placed north and south, with a southern aspect, so that the interior of the frame may be subjected to the full power of the sun throughout the day. The sides are so cut as to slope or slant from back to front in accordance with the relative height of these parts. A good proportion for the relative heights of back and front is 3 parts for the former to 2 parts for the latter; that is to say, if the back be 18 inches high, the front should be 12 inches high, or, if the back be 27 inches high, the front should be 18 inches high, and so on. These are the heights at which the back and front parts of a garden frame are usually made; and if in making his working drawing, the home carpenter regulates his slope over all from back to front at 6 feet, so as to ensure the complete covering of the frame by the light, or lights, this will be enough, as it will determine at once the proper dimensions of the four parts of the frame. I say *four* parts advisedly, as, for the sake of saving space when

the frame is put away for the winter, or is being removed from place to place, it is far more convenient to make it thus, than to nail back, front, and sides together after the manner of a box—a mode of procedure which is all very well for small frames, which are little better than mere protectors, although they are extremely useful and serviceable in the garden.

Best way of making frame.

668. The best way of making a frame is to construct the sides with tenons of some length, as shown in Fig. 383, which tenons pass through mortises cut for their reception in the projecting ends of the front and back. In this illustration A and B represent, respectively, the front and back, and C the side nearest the spectator. The mortises, tenons, and pegs, by which these parts of the structure are connected and held together, are shown at D D; shallow grooves should be cut in the inner side of back and front to admit of the entrance of the ends of the sides to the extent of ¼ or ⅜ inch; or, what is just the same, narrow slips should be nailed on to the inner surface of the back and front, forming a groove into which the ends may drop. Ledges, lettered E, E, are screwed on to the outside of the sides at the top, against which the outer edge of the lights butt and work, and front and back are further connected by a slip of wood at least 3½ inches wide, down the centre of which, longitudinally, a slip 1 inch thick and 2½ inches wide should be screwed, so that a rebate is formed which supplies a suitable bearing in which the inner side of each light may slide up and down. The bearers must be notched into the frame at top or back and front, so that their upper surface may be level with the topmost edge of the top and bottom and the upper edge of the sides. The iron bar across the inside of the lights is shown at H H, and the handles by which the lights are moved up and down are shown at G G. The boards of which the frame is made should be at least 1 inch full, or, better, 1¼ inch full when planed down; so it is better to use boards reputed to be 1½ inches thick at the timber merchant's, or wood yard, where the wood is sawn up. Grooves should be made down the upper edges of the sides of the frame, and down the slips in centre of frames, on which the inner edges of the lights rest. These serve to carry off any water that may find its way in between the edge of the light and the rebate in which it moves up and down. This is shown in Fig. 384, in which the grooves, as mentioned above, are exhibited in section at X, X, X, X; A being the outer side of light working in rebate formed by side slip D, and on edge of side C and B; B, sections of inner sides

Bearers for lights and grooves to carry off water.

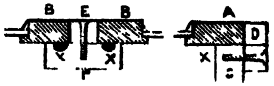


FIG. 384. Grooves in Edges of Side of Frame and Central Slips.

of lights working in rebates formed by the piece E screwed down the centre of the under bar, or slip F.

Long frames for protection.

669. Long stretches of shelter to be regarded merely as plant protectors, but eminently useful in their way for raising and rearing early vegetables and flowers, may be made as shown in Fig. 385, in any convenient position, and in a sunny aspect, by means of boards at front and back placed end to end and closed by boards at each end—the boards being steadied and kept in position by stakes driven in on both sides of them or, better still, by stakes rectangular in form, about 3 inches wide and 1 inch thick, sharpened to a point at the lower end to enter the soil, and screwed to the boards either inside or outside. The frame thus made is then covered in by a row of small lights, say 4 feet long by 3 feet broad, glazed, or covered with oiled calico, or even with oiled paper, placed side by side, top end upon the board at back, and the lower end on the board in front. Ventilation may be secured in the ordinary way, as in the garden frame by putting on slips from back to front with a slip nailed on to form rebates, in which lights may slide up and down; or it may be effected by raising the frames in front or at back by supports, generally known as "set-opes" cut-step fashion as in Fig. 386, so that more or less space may be given for the entrance of air according to the state of the weather. These set-opes may be used for propping up lights on garden frames as well.

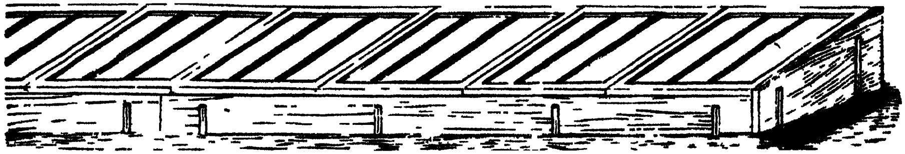


Fig. 385 Long Frame or Protector, with Range of Smaller Lights on top

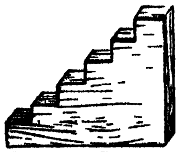


Fig 386 Support for Light

Remarks on cool greenhouse and vinery, etc.

670. This will afford the home carpenter sufficient guidance as to the mode to be followed in making garden frames; and we will now turn our attention to the construction of a cool greenhouse, and a vinery, and cucumber house, which will be sufficient for all practical purposes for the home carpenter; but before entering on the construction of these houses it may be as well to make a few remarks by way of introduction. If a removable greenhouse is wanted as tenant's or occupier's fixture, I have already shown how a removable house may be

built; and it is as easy for the amateur wood worker to build a glazed structure as one of wood, inasmuch as the latter consists of parts framed, covered as it were with a wooden skin and bolted together, and the former will be made in the same way, but the panels of the framing will be filled at sides and ends with glazed lights butted against rebates, formed by nailing slips to the framing. The greenhouse and the vinery I am about to describe will be irremovable, and both of them will be warmed by sun heat only, for time would fail me to touch on the widely various modes of heating now in vogue. Let the home carpenter steadily bear in mind that it is impossible to build a single glazed structure that will serve for work of every kind. Therefore it is that I will show him how to make a cool

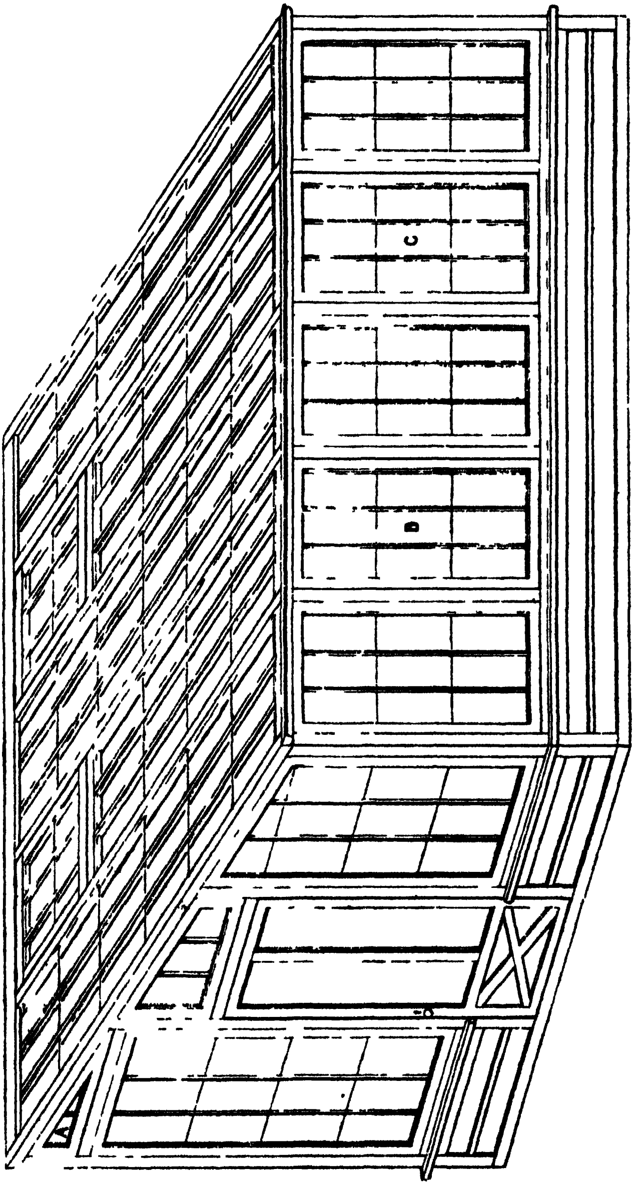


Fig 387. Cool Greenhouse for Flower Culture.

greenhouse which will serve for the culture of flowers, and may be easily rendered frostproof, and how he should construct a vinery and cucumber house in combination, divided, nevertheless, by a partition, so that the two parts of the house may be kept close, or subject to ventilation, just as the occupants of the two parts may happen to require.

671. The amateur wood worker will find it necessary to adopt a slightly different style and size in making lights for his greenhouse, to that which he has followed in making his garden lights. In Fig. 387 I have endeavoured to furnish a sketch design for a cool greenhouse for flower culture, which is, indeed, somewhat more than a mere sketch, inasmuch as it is drawn as closely as it is possible to do so with regard to dimensions, and also with reference to points of detail. The house itself is supposed to be 15 feet long, 9 feet wide, and 10 feet in height at back, and 6 feet 6 inches, or, at the utmost, 7 feet in front. The amateur can make his house as much larger or as much smaller as he pleases; but he will find this a convenient size, and sufficiently large for all practical purposes. His first care will be to put up the framework of the structure; and if he has a brick wall of sufficient height, against which to place it, for it is what is technically called a "lean-to," so much the better. If he has no wall, and cannot afford to have one built for his purpose, he must make one of rough boards, 10 feet high and 15 feet long, forming an external and internal skin on a stout framing of uprights and transverse bars, 2 inches square or thereabouts the inside put on first vertically, and the outer skin horizontally, so that the open spaces between the skins and framing may be filled with some non-conducting material, such as sawdust, cinder, or coal ashes, or a so-called "wool packing" that I believe is used for this purpose, which will have the effect of keeping the house warmer and preventing any ill effects from north, north-easterly, and north-westerly winds against the back of the house, which should have a direct southern frontage, or from south to south-west, so as to have the sun's rays upon its front if possible during every minute of sunshine.

Cool greenhouse for flower culture.

Back of house

672. The house, as I have said, is 15 feet long, 9 feet wide— the home carpenter may make it widei if he likes; 10 feet high at back and 7 feet high in front, including wallplate by which the roof is sustained. The first thing to be done is to take out a trench about 12 inches deep in front and at the sides, if there be a brick wall at back against which to build the house, and at back too, if there be not. This trench should be filled with courses of brick work or concrete, it does not matter which, up to

Walling in front.

and slightly above the level of the ground, and on this brick work place a stout sill of timber 4½ inches wide and 3 inches thick. This should be done, as will be readily understood, before the back of the structure is formed. If a wooden back as described above be made to the house, it is probable that a wooden wall, so to speak, will be made at the sides and in front under the glass. When the sill is properly laid- -and let the parts cross at the corners after the manner of an Oxford frame,—when the sill is halved together at the corners, and the framing of the wall at the back, that is to say, the standards have been mortised into it, and the wall itself completed, there should still be a width of 9 feet from the inner surface of the wall to the front, as the wall is not included in the width allowed for the house, mortise into the sill at back two uprights 3 inches square and 10 feet 6 inches long, and bolt them or screw or nail them to the back wall of the house, and also two uprights in front, of the same width and thickness, but 7 feet 6 inches in height. These will form the four corner posts of the greenhouse. Now settle where the door is to be -we will suppose it will be in or near the centre of one of the sides as shown in Fig. 387—and mortise into the sill two uprights 3 inches wide 1½ inches thick and 10 feet long, as any excess in height can be taken off when the parts of the framework are finally fastened together. Next, in order to make the wooden substructure or walling of the house in front and at the sides, mortise into the sill on the foundation at suitable intervals, stout uprights 3 inches wide by 1½ inch thick, letting the width face outwards and inwards all round. Let these uprights be 12 inches high exclusive of tenons, which must enter the sill below and the plate above. When they are set in their places prepare a plate to receive the tenons of these at the top 3 inches wide at 1½ inches; and let this plate run all round on the top of these short uprights from the corner post at back to corner post in front, then from front corner post to front corner post, and then returned again from second front corner post to second back corner post. This plate will, of course, be broken in its course on one side by the panels of the door. Nail felt,—tarred roofing felt will do if you cannot get any other thinner material—to the short uprights of the wooden wall on each side, and then put on the external and internal wooden skin which will be presumably stout ¾-inch stuff. Let the boarding on both sides run horizontally, and nail or screw a thin slip with the top edge bevelled over the joint, for you will need two boards of equal width, in order to hide it. The wall will be of the same thickness as the corner posts. Fill up between the inner skins of felt with non-conducting material, and then having put on the plate

Framing in front and at sides.

fix immovably all the parts that have been already connected, and consider that you have arrived at the end of the first stage of the construction. It would be as well to put an inner and outer skin of felt between the wooden skins of the back wall of the house. The felt is used because it is a non-conducting material, and the house will be all the warmer for it.

673. The next step will be to impose on the place which now forms the top, so to speak, of the wall a broad sill, at least 5 inches in width or perhaps a trifle wider, and 1½ inches to 2 inches thick, and let this run all round the house, fitting it neatly round the corner posts and to the jambs of the door. Securely fasten this in place as soon as it is ready, and before doing so bevel it on the upper outer edge to allow the rainfall to run off readily. Let the back of this sill be flush with the inner surface of the corner posts, jambs, etc. Next, place on this sill another plate 3 inches wide and 1½ inches thick, with the inner edge flush with the inner edge of the broad sill below: divide

Construction of front of house.

this plate in front into four equal divisions, and at each division mortise into it an upright 3 inches wide 1 inch thick, and about 5 feet 6 inches high. Then, remembering that the height of the house in front is to be 7 feet, stretch a cord at this height from the upper surface of the foundation sill, from corner post to corner post along the front of the house, and mark each corner post and upright at the place where it is crossed, and make another pencil mark just 3 inches below the first. Then prepare a wallplate 3 inches square and 16 feet long, and lay this on the corner posts, having first cut off these and the other front uprights to the upper pencil mark; and mark the places where it will be halved or otherwise attached to the corner posts and where the narrow uprights, which, the home carpenter must remember, present the narrow side to front and back, must be mortised into it. Having cut the mortises, etc., let the wallplate in front drop into its place.

674. It will now be necessary to attach to the back of the house at the height of 10 feet, a wallplate 4 inches wide and 1½ inches thick, against which the upper ends of the rafters or sash bars will butt, and notch the corner

Preparations for roof.

posts at back, so that this may be dropped behind them. Then on each side of the house, carry a strong rafter, 3 inches wide and 2½ inches thick, from corner post at back to corner post in front. The jambs of the door will be mortised into the rafter on the left, according to Fig. 387. They should be cut at the lower end, so as to present an end 1 inch above the upper surface of the wallplate. Before putting these in place and securing them, insert transverse rails, 3 inches wide and 1 inch thick, between corner post and jambs, and the jambs themselves with the under surface, level with the under surface of the wallplate in front. The rail between the jambs will form either the lintel, or a basis for the lintel of the door. Put also another transverse rail from corner post at back of the house to the jamb of the door, divide the other side of house into three equal parts by two uprights 3 inches by 1 inch, and by transverse rails of same size corresponding to those on the side in which the door is. The sides are thus vertically divided into seven panels, in one of which, A, a light to open will be placed to serve as a means of ventilation in time of need.

Rafters of roof.

675. It is desirable to have two ventilators in the roof; and therefore, to afford a better bearing for these, let us place rafters 2 inches wide and 1½ inches thick from wallplate at back to wallplate in front, exactly over the places where the four uprights in front enter the wallplate by mortise. I have omitted to say, that the upper tenons of these should not be carried right through the wallplate, but to the distance of one-half or two-thirds its thickness. By adopting this course, you prevent the slightest chance of injury to tenon from accidental soakage from above. I may as well say here, that rafters and sash bars for greenhouse roofs of the form shown in Fig. 388, may be bought for greenhouse work, and that the home carpenter may save himself much trouble by availing himself of these. Fig. 388 is exactly one-half full size of the sash bar that may be used between the four rafters; the rafter should be a little stouter. Transverse rails will have to be put in the roof between the rafters as shown in Fig. 387, to carry the ventilators, and these rails must be of themselves stout and strong, as the ends of the rafters below the ventilators will have to be butted against them. As the space between the rafters is nearly 3 feet, the frame of the ventilator need not be wider than 12 inches. Further, a casing had better be put up as a lining to the opening on which the ventilator may rest. The ventilators may be opened and closed by a simple contrivance shown in Fig. 389. Let us suppose A to represent the frame of the ventilator, and B the framing or casing on which the lower edge rests. If an iron stay, C, of sufficient length be screwed to the ventilator, and a pulley, E, to the framing or casing on which the ventilator rests, when the free end of a cord, D, passing over the pulley and through a hole in the end of the stay is pulled, the ventilator will be raised, and when the cord is slackened it will be closed. To keep the ventilator open, the free end of the cord must be passed round a cleat fixed below at any convenient place.

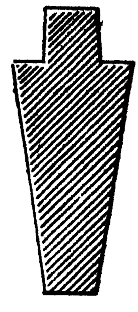


FIG. 388. Transverse Section of Rafter on Sash Bar.

Fitting and fixing rafters to wallplates.

676. Perhaps, a few words will not be out of place with regard to fitting and fixing rafters to wallplates. It is a difficult job altogether, and one which I have seen many a professional bungle over. Now in Fig. 390, let A represent wallplate at back of house, and B a fillet nailed to it along its lower edge, C and D the ends of one of the rafters, E the wallplate in front of house, and F the rebate of the rafter into which G, the glass, is dropped. At H is shown a piece of wood that I always nail on to and over the wallplate *between* each pair of rafters, with its upper surface in the same plane with the bottom of the rebate of the rafter. The end of the rafter itself should project to the edge of the wallplate, and stand about ½ inch above it it must not be supposed that the rafter ends at H, on the contrary it is notched on to and over the rafter to the edge of E, and then to work a template to the fullest extent. Now it will be easily seen that there must be some difficulty in cutting each end of the rafters to the proper shape so as to fit exactly, and the better plan to my mind is to stretch a tight cord from A to front upper edge of E, after tacking on a small fillet ½ inch square in the form of each end, making the upper edge of each piece coincident with the cord. We thus get the form of the fitting of each end, and if we take another thin piece of the length that the rafter must be from end to end to butt against A, and notch on to B and E, we get a template of one of the rafters approximately if not precisely exact, which may be easily worked to exactness; and by this template we can cut all our rafters with precision as to length and shape at ends, and nail them in place. A moulded zinc gutter K is attached to the front of the wallplate to receive and carry off the water from the roof, and L is a broad plate, nailed over wallplate at back and over rafters to keep out the weather. The end of the uppermost pane of glass passes up under this; I put on the pieces as shown at H, to receive the lower end of the lowest pane of glass, because I have found that if there is nothing of this kind on which to bed the glass, the glass itself is always liable, or more liable to fracture, which necessitates repair. I need say nothing whatever

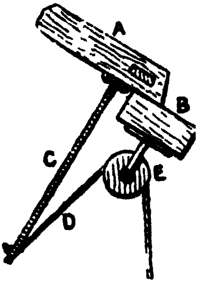


FIG. 389. Mode of Raising and Closing Ventilator

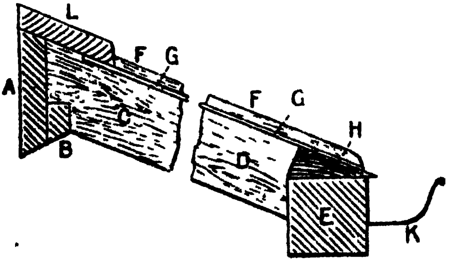


FIG 390 Mode of Fitting and Fixing Rafters to Wallplates

about glazing, as the mode of doing this has been treated in my instructions for making a garden light.

677. The home carpenter has now to make his lights to fill up front and sides; but before going into this let me say, that to make the rafters of the roof and to nail fillets to the *sides*, as some may be led to do, to form a rebate for the glass, is not a good plan, though we must do it in the case of the large rafters at each end of the house. Lay on plenty of thick paint, both on rafter and fillet, before the rafter is nailed on. I have found that the heat of the sun is apt to cause shrinkage in fillets nailed to the sides, and leakage has ensued. A slip nailed along the *top* to form the rebates, one on each side of the slip, or fillet, is always best. No directions I am sure are needed for making and hanging the door and putting on the necessary stops. Every light to be inserted in openings in the framing in front and sides, altogether eighteen in number, namely, five in front, seven on the right side, and six on the left, may be made in the same way as the garden light, each of sufficient size to fit exactly into the opening it is intended to fill. They need not, however, be quite so heavy in make as the garden light. The framing may be 1¾ inches only in thickness; and when just in place, they must be butted and bedded against stops, nailed round each opening in the main framing. And as this is 3 inches wide, the thickness of the lights will regulate the width of the stopping. All the lights will be fixed in place except A and its corresponding light on the right-hand side, which will be hung by hinges to the rails above them, and B and C, which will be hung to the lower surface of the wallplate. Stays, perforated at intervals with holes, must be attached to the lower rail of the lights that are to open, that they may be opened to a greater or less extent according to need. The holes in the stays fit on to pegs of iron placed in the lower stops for this purpose. The rain water from the gutter, or shoots, may be carried into the greenhouse and into a tank made in the floor for its reception.

Lights for front and sides.

678. With regard to floor, this may be made of cement, or in the mode I have described for flooring summer houses. A shelf, from 15 to 18 inches wide, should be placed along the front from end to end of house, whereon to stand plants; and this should be covered with slate, gravel, or shingle; as plants in pots, stood on a bottom such as this, need no saucers. The back of the house may be occupied with a stage of as many tiers as the home carpenter may find it convenient to make. With injunctions to put on three good coats of paint, both within and without the house, after

Floor and interior fittings.

everything has been fixed and the roof and lights glazed, I may bring my instructions on greenhouse building to a close.

Span-roof greenhouse, etc.

679. It is now necessary for me to enter upon the construction of the vinery; but before doing this, let me say something that I might as well have said at the conclusion of the last section with reference to the mode of building both vinery and greenhouse. I gave no instructions with regard to building a span-roof greenhouse; so let me say now, that, if the home carpenter prefer this mode to the lean-to, and does not care to incur the trouble and labour of forming a back, if necessary, he has only to alter the shape of the ends to gable form, put up a glazed back similar to the front that he has already made, and make his roof similar to the span-roof of the vinery yet to be described. The instructions to be given for the span roof of the vinery will be found to the purpose for constructing the roof of a span-roof greenhouse; and the instructions in the mode to be followed in various items of construction as given for the lean-to greenhouse will be found equally serviceable for the span-roof vinery, and so require no repetition.

Distinction between vinery and cucumber house.

680. The chief points of difference between the vinery and the greenhouse are, that the height of the sides is very low, while the height of the sides of the greenhouse rises to some feet: and that to enter the vinery we must go down three or four steps, but we enter the greenhouse from the original ground level, or by the ascent of a single step. These, possibly, are the most noteworthy features of difference. The mode of construction does not count; for, as I have said, we may make a greenhouse as a lean-to, or with a span-roof; and we may make a vinery a lean-to, but this is in no way desirable. The general aspect of a span-roof vinery will be easily comprehended and understood from Figs. 391, 392, and 393, which, respectively, exhibit its end elevation, side elevation, and plan. The vinery and cucumber house combined is the same at both ends. Fig. 391, therefore, serves as end elevation of each end of the structure, and, omitting the ventilator above the door, as elevation of the partition between the vinery proper and the cucumber house. If I am asked why an undivided house will not answer as well as a divided one for vines and cucumbers, let me say, that the same degree of temperature will not suit both at all times. Frequently, especially in the early stages, air must be freely given to vines, when cucumbers must be kept close. But I am not writing on gardening now, and cannot dwell at length on such points as these.

681. A general idea of the construction of the combined vinery and cucumber house may be gathered, as I have said, from Figs. 391, 392, 393.

Being drawn to a scale of $\frac{1}{8}$ inch to 1 foot, the relative proportions will be easily recognisable and determinable. Thus, the width of the vinery from B to C is 14 feet, its height from M N to A is 11 feet, the width of the footway that runs through the houses from end to end is 3 feet; K L shows the original level. Now, for convenience and illustration's sake, I have supposed the length of the vinery part to be 18 feet, and of the part allowed to cucumbers to be 10 feet, because such a disposition of space will allow nicely for three vines on each side of the house, and five cucumber plants. Now, the home carpenter, bearing in mind that the ends of the house should have a northerly and southerly aspect, so that the sun's rays may fall on the sides of the house throughout the day, must first look out as level a piece of ground as he can find, and stake out an area 28 feet long and 14 feet wide, and a slip through the centre of this area, 3 feet wide and 36 feet long, which will leave a space of $5\frac{1}{2}$ feet on each side of it. Thus, supposing S T (Fig. 393) to represent the width of the house, the sides, shown by S W and T K, will have to be carried on to the length of 28 feet in the same straight line. A straight line from W to X will define the partition between the two parts of the houses, as S W = M N = N V = T K = 18 feet; S M = W U = N T = V X = $5\frac{1}{2}$ feet, and Y Z = M N = U V = 3 feet. The intending builder from these data can easily draw a ground plan on a larger scale for himself, and mark in the details as I am about to describe them. In Fig. 391 K L represents the

Plan of vinery.

FIG. 391.

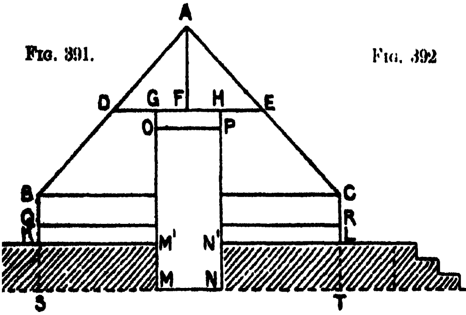


FIG. 392

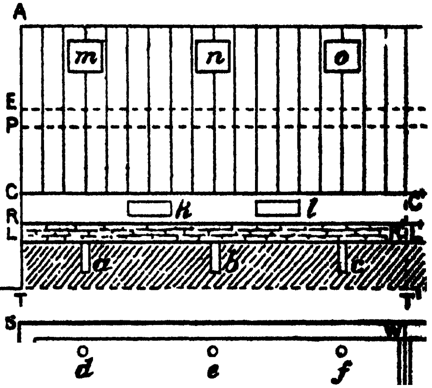


Fig. 391. End Elevation of Vinery and Cucumber House combined, showing Entrance and Ventilator above. Fig. 392. Side Elevation showing Steps at Entrance and Ventilators on Side Walls. Fig. 393. Plan showing Sunken Footway. Drawn on Scale of $\frac{1}{8}$ inch to 1 foot.

Ground plan.

Excavations for foundations.

original ground level and the soil along the central footway from Y Z, the edge of the topmost step, to the edge of the topmost step at the other end; and beyond the other entrance to the cucumber house will have to be excavated. In point of fact, the width of the footway should be taken out to 4 feet, because it will be necessary to build a containing wall of brick 4½ inches thick all the way along on both sides, from Y and Z to the other end, and to form the steps at Y Z, two in number, of brick: the topmost step, whose edge is shown at Y Z, consisting of a row of brick laid on, and into the ground, which must be recessed to receive them. Further, it will be necessary to take out a trench all round the wider central area, that a brick wall 9 inches thick may be built all round, and carried up to the height, or nearly so, of Q R. The inside of this wall should butt firmly against the soil left within it; and the outer surface should coincide with the outer line A T X and M S W. Therefore, the width of the excavation must be carried outwards and not inwards. Place the soil that is taken out, or as much of it as the space will hold, on each side of the central footway. When the back walls have been built up, the surface should be about 9 inches above the level of the ground. It should contain wood bricks at intervals for the fastening down of the framing that is to be reared on it. Slits about 4½ inches in width and 15 inches long should be left in the brickwork for the introduction of the stems of the vines within the house. These will be brought up *through* the soil within the house as shown by D, E, F, G, H, I, in Fig. 393. The positions of the slits are shown at A, B, C, in Fig. 392.

Jambs for doors.

Framing round house.

682. When this has been done, stout frames for the doors, composed of stuff at least 3 inches by 2 inches, composed of sill, jambs and lintel or architrave, should be put up at each end, and at U V (Fig. 393), between the two compartments. The frames should be 7½ feet high, so as to give room for a ventilator, about 9 inches wide, above each door, to be used if occasion require it. The width of the jambs will reduce the width of the doors themselves to 2 feet 8 inches. Supposing Q K – R L to be 9 inches, this will leave a space of 15 inches all round the house, from Q R to B C (Fig. 391) to be filled with a stout framing composed of lower wallplate resting on outer edge of the brick work, and an upper wallplate to receive lower ends of rafters. These wallplates should be 3 inches by 2 inches, and be framed together by short standards of the same width and thickness, and 11 inches high from plate to plate. This gives us a continuous framing, 15 inches high, all round the house. Nail stops 1 inch square in centre of panels, and fill in without and within with boards cut to fit apertures closely, and run a bead round edges of outer surfaces. Make panelling in such

a way as to admit of sliding ventilators, as shown at *k l* (Fig. 392). These may be 2 feet in length, and being constructed in this manner to slide between stops or beads attached without and within to wallplates, may be opened for any distance so as to leave open the entire aperture. The rafters represented by A B, A C in Fig 391, and by A C, A′ C′ in Fig. 392, are 10 feet in length, and are notched into the upper wallplate of framing round house and butted and notched against a ridge-plate extending from end to end of house. The rafters at A B, A C, at A′ C′, and those corresponding to A B, A C at the other end, should be more substantial than those intermediate to them. Horizontal ties should run from rafter to rafter, as shown at D E, and these should be placed between A B, A C, from rafter to rafter, under central ventilation at N, between A′ C′ and its corresponding rafter on the other side, and over door at other end of combined house. Into centre of these ties, as shown at F A in Figs. 391, 394, mortise into the tie at F between G H an upright F, which extends upwards until it meets the lower edge of the ridge-board, so as to form a support for it. Connect ridge-board and upright by fillets on pieces of same width as upright, screwed to each. Thus the top of F and the fillets G′ H′ form, as it were, a notch into which the ridge-board drops. This arrangement affords support for ridge-board at suitable intervals, and will prevent it from sagging. It will be understood that ventilation must be made in the roof at M N O.

Ventilators in framing: rafters.

Support for ridge board.

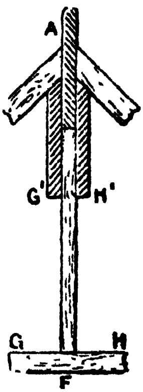


FIG. 391 Upright to carry Ridge Plate

683. After all that has been said above on the construction of a lean-to greenhouse, the home carpenter will find no difficulty whatever in finishing the roof, the doors and every other part of the house, including the partition between the combined houses at A′ C′ which will rest on the brick work at W U and V X (Fig. 393). The containing walls at M M′ N N′ will be carried up to the level shown by Q R, and finished by a coping of bricks resting half on the wall itself, and half on the side within. This should be raked smooth to the level of Q R, after the vines have been introduced through the slits in the walling and let up into the house. Before this can be done, the vine borders on each side of the house, outside S W I X (Fig. 393), from end to end, must be made with proper drainage in the usual way; but for this the reader must be referred to such a work as *Beeton's Garden Management*, published by the publishers of this volume. When the roots of the vines have been carefully disposed in the borders, and the stems led inwards and upwards, the work of completion within and without may be rapidly proceeded with, and the house itself finished in every respect. Provision should be made at M M to draw

away into a pit formed below and filled with brickbats, etc., any rain that may fall into this area. The water from the roof should be caught in guttering and led into a large tank formed within the house, and preferably below the level of the footway. It can be easily pumped up, and will prove of the utmost service in watering the cucumbers, etc. During the autumn and winter months, use may be made of the platforms on either side of the footway for chrysanthemums, azaleas, camellias, and any hardy hard-wooded plants. The vine borders outside will be made up to the level Q R, and slope downwards to the original ground level. They should be at least 5 feet wide.

Wiring for training vines and cucumbers.

684. I think I have now touched on every point connected with the construction of the combined vinery and cucumber house, except the wiring within that is necessary as a means of support for the vines and cucumbers that will be tied to them. The wiring must be just 12 inches below the glass. The best way to put it up will be to let a second wallplate run along the surface of the brick wall that supports the wooden framing running round its *outer* edge. Let this plate run along the inner edge, due provision having been made for its attachment. Then fasten strong rails about 2 inches by 1½ inches or a little less in thickness, from support to support of the ridge-board, at the prescribed distance under the glass. Into these screw eyes, and under each rafter stretch a stout wire, placing wires of extra stoutness at each end, and at the middle tie and support under the central ventilation in the roof at *n* (Fig. 392). You will then have a succession of wires corresponding with the slope of the roof, from one end of the house to the other 12 inches apart. I have omitted, I think, to point out that the sides of the roof are placed so as to form an angle of 45 with A F, so that they are at right angles to each other. I will, at all events, rectify the omission now. Then all along, from A C to A′ C′, stretch transverse horizontal wires of less thickness than the medium wires under the rafters, attaching them to the thick end wires, which must be secured by eyes in the wood work of the ends, and a wire here and there, from main wire to wood work, from giving too much to the strain of the transverse horizontal wires. Interlace these with the sloping wires, putting them about 12 inches apart, so you will want about 9 of them. Secure at every crossing by a few turns of binding wire; and you will find that you have under the glass a strong lattice work of wire that will afford support for the central rod and two lateral rods of each vine, and for the young wood that will grow each year laterally from the knots that will form in the rods, and on which the bloom and bunches will come.

END OF PART II.

HOME CARPENTRY FOR HANDY MEN.

PART III.

Carpentry suitable for the Farmstead.

> *Every lane's end, every shop, church, session,*
> *Hanging, yields a careful man work.*
>
> *Winter's Tale*, iv., 3.

CHAPTER I.

FENCING FOR THE FARMSTEAD. FIXED AND TEMPORARY; MOVABLE AND IMMOVABLE.

Introductory—The Subject-matter of the Part—The Overlapping of Subjects unavoidable—Utility of Hurdles of all kinds—The Hurdle pure and simple—Preparation of Uprights to receive Rails—Making of Holes for Rails—Setting up Hurdles—How to make Beetle or Mallet—Other Uses for Hurdles—Connecting Links or Bands for Hurdles—Frame for Wattle Hurdle—Boring Holes in Frame—Mode of making Wattle Hurdle—Wattle Hurdle as Gate—Hurdles as Shelter—Hurdles of Cask Staves—Construction of Hurdles upon Hinge—Nailing Staves to Foundation—Other Kinds of Hurdles—Hurdles as Shelters for Sheep and Cattle—Fencing: Fixed and Immovable—Fencing for Ponds—Jointing of Rails to Posts—Completion of Paling—Palings to keep Poultry within bounds—Paling across Narrow Space between Walls—Provision for Transverse Rails and Gates—Gates and Stiles of different kinds—Ordinary Field Stile—Stepping-piece to Stile—Swing Gate or Swing Stile—Sussex Gate: its Principle and Construction—Light Entrance Gate with Rounded Bars—Lower Hinge for Entrance Gate—Repairing Fences—Barbed Wire: how to make it.

Introductory.

685. So said, and, doubtless, so thought Autolycus the rogue of *A Winter's Tale*. In a like spirit, although prompted to the speech in a very different way, the home carpenter who is lucky enough to own a little farmstead hard by his dwelling may say, "Every path's end, every shed, stable, look-round, enclosure yields a careful man work"; and the longer he tenants his farmstead, whether as occupier or as absolute owner, the truer he will find the thought; for few days will pass without discovering, to an observant eye, some repair to be effected, some addition to be made, or some improvement to be carried out, that to a careful man like himself will not fail to yield work,

till he begins to think that man's work, as woman's is said to be, is never

The subject-matter of the Part.

686. Our next thought must be as to what is to be discussed in connection with the farmstead: and to this the reply must be everything more or less that is to be made or done in connection with the buildings that are on it, or must be placed on it, whether fixed or movable, and every animal that is found or kept either on it or in it,—everything, indeed, or as much of everything pertaining to the farmstead that can be dealt with in the space that can be assigned to this Part: but, after all, those things chiefly that are to be made or done or kept in order to promote the good appearance of the farmstead itself, and the well-being of all those things that are kept in it or on it.

The over-lapping of subjects unavoidable.

687. It will prove more convenient, I think, in this the first chapter of the Part to deal with fences, fixed and temporary, movable and immovable. I have already in previous pages said something about fences suitable for garden work, but even now there is much to be added. And here let me point out that in a subject like Home Carpentry, of exceeding length and breadth and width, it is impossible so to regulate the divisions and sub-divisions in such a way that every part is absolutely separate and clearly distinct from all others. Thus, things described in one part will clash and commingle with things described in another by reason of their affinity. In the present chapter let me seek to show the home carpenter how he may make enclosures which nothing but a pigeon may overtop, and movable fencing by which he may divide his paddock and grazing land into smaller portions; how to make hurdles of different kinds, that, being removable at pleasure, will afford temporary fencing to the plot, and restraint to the dairy cow, who may go up and down therein at pleasure as long as there is grass therein for it to eat.

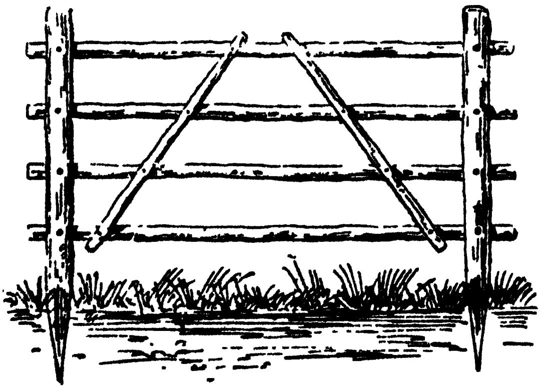


FIG. 895. The Hurdle pure and simple.

Utility of hurdles of all kinds

688. And first with regard to the hurdle pure and simple, which stands about 3 feet 6 inches out of the ground when the points of the uprights have

been driven into it, and which usually consists of four rails, although the amateur may make five-railed hurdles—or even six—if he likes to put the bars closer or make the hurdle higher; but I must warn him that if the bars are put too close together the uprights will be unnecessarily weakened, and if the hurdle be made too high there will be a difficulty in driving it into the ground, as the home carpenter will see presently. The hurdle itself, which is about 6 feet long, is shown roughly sketched in Fig. 395. But although of necessity roughly sketched—for the hurdle after all is a rough-and-ready affair, and there is no such nicety and parallelism in farm work such as this, as there is in work made of sawn wood for the house and garden a proper proportion has been preserved, and the hurdle shown in Fig. 395 may be said to be drawn on a scale of ⅜ inch to 1 foot. It consists, if we regard the parts of which it is composed, of two uprights about 5 feet long, 3 inches wide, and from 1¼ to 1½ inches thick; four transverse rails about 6 feet 6 inches, or 6 feet 8 inches long, to admit of the projection of the ends beyond the posts, about 2¼ inches wide and 1¼ inches thick. I have said *about* with reference to the dimensions; for in rough work like this there is no parallelism of edges, as in sawn wood truly planed up, and in hurdles made of ash, larch and other coppice wood generally split and trimmed into shape with axe and bill; everything, as I have said, is hewn out and fashioned in a rough-and-ready method. Only at the ends of the transverse rails is there any semblance of smoothness, these having been taken off as smoothly on both sides with the bill, and shaped at the ends so that they may enter readily and yet fit tightly when the parts are driven up home into the holes in the uprights cut for their reception. In addition to the transverse rails there are two bars made in the same way, about 3 feet 8 inches long, 1¾ or 2 inches wide, and 1¼ inches thick, used as struts to impart strength and rigidity to the hurdle whose topmost bar might otherwise soon be broken through by any heavy superincumbent weight suddenly imposed on it.

The hurdle pure and simple.

689. The only nice piece of constructive work required in the hurdle is the making of the holes into which the ends of the bars are to be fitted. It may be taken that from the centre of one transverse rail to the centre of the next rail to it there is a distance of about 9 inches. There is no occasion to give a diagram of the upright from top to bottom, so I have shown the upper portion of it which is entered by ends of the topmost and second rails, and for clearness' sake I have done this on a scale of 2 inches to 1 foot. The width of the uprights or standards of the hurdle I have stated to be 3 inches. Firstly, down the centre of the width, longitudinally, stretch

Preparation of uprights to receive rails.

a chalked line, and by drawing up the line and releasing it suddenly when drawn up, make a chalk mark down the inside of the upright, as shown from A to B. Make your spaces accurately from bar to bar with the rule, taking them from the centre of one bar to the centre of the other, and having drawn transverse lines across with pencil and rule as squarely as you can—the square is but of little, if of any, use to you in work like this, owing to the rounding and irregularity of the outside edges of the uprights mark out 1 inch above and 1 inch below each of the transverse lines, which will give a length of 2 inches for the admission of the rail. Using a good sharp 1-inch bit, firmly set in the brace, bore completely through the uprights two holes, one above and one below the central transverse line, and then clear the projecting pieces that are left between the holes with a mallet and chisel. Having done this in both uprights, shape the ends of the bars with a paring chisel, rounding the edges of the bars above and below to suit the roundness of the hole for its reception at top and bottom. Now put the ends of the bars into the uprights, and drive home as tightly as possible by hitting the *outside* of the uprights with the mallet. Next, I like to use oaken pegs instead of nails when I can bore holes with a $\frac{3}{8}$-bit through upright and bars from edge to edge, enlarging the hole to about ½ inch on the side at which you began to bore, with a taper bit. Have a number of oaken pegs cut to a point, and from 4 to 5 inches long they call larger pegs of this kind treenails in wooden shipbuilding all ready, and then drive these into the holes and tightly home, cutting off the projecting ends on either side when you have done so. I should say that before making the holes for the pegs you should measure the distance from upright to upright along the topmost and lowest rails, taking the measurement *within* the uprights, so that you may be sure of their parallelism, and resting the hurdle on the ground against anything that is convenient; after making sure that the distance from lowest bar to point of standard is the same, test for *uprightness* of standards or uprights with the plumb level. All that now remains to be done is to nail on the diagonal struts or braces, as shown in Fig. 396, and your hurdle is then finished.

Making of holes for rails.

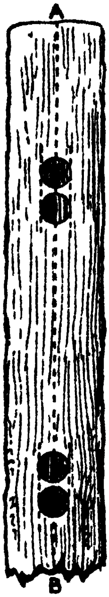


FIG. 396. Side Elevation of Upright for Hurdle.

690. The home carpenter and farmer will no doubt have to make a good many of these; but when he has made half-a-dozen or so, and become tolerably *au fait* at the work, he will be able to turn them out more quickly than he

may think after making his first. When setting them in place he must first set out his line along which he intends to place them, with a garden line or some substitute for it, and make holes in the ground for the reception of the pointed ends of the uprights with a pitcher or iron bar, driving them down securely by the aid of a beetle or heavy wooden mallet, which is shown in Fig. 397. If he does not possess one of these he should make one for his own use. He should provide himself with a sound piece of beech, about 5 inches in diameter, and if he has a lathe turn it, and if he has not reduce it with plane and chisel to as perfect a cylinder as he can, from 4 to 4½ inches in diameter. A hole for a handle must be bored through it, as shown. The length of the cylinder should be about 8 inches, and the handle taken altogether from 3 to 4 feet long. When the beetle has been made it must be sent to the village blacksmith, to be fitted at each end with iron rings, as shown, about 1 inch in width and $\frac{3}{16}$-inch thick. The wood should project slightly beyond the rings when they have been put on and shrunk into place. If the home carpenter lives in the country he will find one of these indispensable, as he may often have roots of trees and rough logs of wood to split up for fuel in the winter season, and he can do this far more easily with a beetle and iron wedges than he can with an axe, however large. Iron wedges steel tipped are sold by ironmongers at 4d. per lb.; and the home carpenter should provide himself with three or four of different sizes. The work affords splendid exercise for the muscles of the arms, back, and loins, and there is something pleasant in listening to the rending of the wood as it yields to the outward pressure of the wedges as they are driven one after the other into the cleft that reluctantly yawns more and more until cohesion is utterly overcome and the parts fall asunder.

Setting up hurdles.

How to make beetle or mallet.

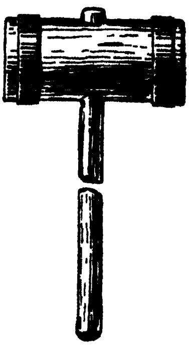


Fig. 397 Beetle or Mallet.

691. If hurdles such as I have been describing are required as shelters, this end can be best achieved by interweaving such materials as furze or gorse between the rails; and in this way they can be made available for keeping geese, ducks, etc., in restraint, which would otherwise make their way out of an enclosure made with them under and through the bars. Hurdles such as these are, however, best calculated for divisional purposes as described, and for fencing off small portions of any piece of ground under turnips in which sheep are to be fenced for the purpose of eating them off. Moreover, this affords an easy means of dressing the ground, obviating the

Other uses for hurdles.

Connecting links on bands for hurdles.

necessity of bringing manure from any distance, whether small or great, and therefore means also of lessening the cost of labour. Another use may be found for hurdles of this sort in the garden, for when placed along the middle of a row of kidney beans they will afford an admirable support, the bean vines being allowed to go as far as the top of the hurdle and there stopped. In order to keep them in place, and to hold them well together, it is as well to slip over the adjacent standards of each hurdle, and that which is next to it, a band formed of hoop-iron having the ends inverted together. The amateur can easily make these for himself, for nothing more is requisite than to cut pieces of hoop-iron to the required length, that is to say, about 24 inches long, to allow the ends to overlap for 3 or 4 inches, to punch two holes through the overlapping ends and then to insert rivets—preferably copper rivets and to fasten down by hammering the small end of the rivet until sufficiently spread to grip and hold the iron.

Frame for wattle hurdle

Boring holes in frame.

692. There is another kind of hurdle, known as the wattle hurdle, which is as useful in its way as the ordinary hurdle, if not more so for many purposes, and is as easily made. The first thing to be done is to make a frame or foundation for the hurdle, as shown in Fig. 398. This is a piece of wood about 3 or 4 inches in width and the same in thickness, and of the length of which it is desired to make the hurdle. Still, as a hurdle of any length less than the length of the wood itself can be made on a long piece of wood as well as a short piece, it will be convenient to take the length of the frame or foundation at 6 feet 6 inches, or 6 feet 8 inches, which, if the length from outer hole to outer hole be placed at 6 feet, will leave a projecting piece of 3 or 4 inches, as the case may be, beyond each hole. A chalk line should first be made longitudinally down the centre of the wood, from end to end, and transverse lines drawn with square and pencil at every 6 inches from the first transverse mark; thus, if the length of the wattle hurdle is to be 6 feet there will be thirteen transverse marks, from end to end, 6 inches apart. At the crossing of the chalk and pencil lines at each end bore holes 1¼ or 1½ inches with a twist or screw auger of the same diameter, or with a brace and centre-bit; but I may say that the work will be done quicker and with greater ease to the home carpenter with the screw auger. Then at each of the eleven intermediate crossings bore holes, 1 inch in diameter, with a 1-inch screw auger or centre-bit. It is better in all cases that the

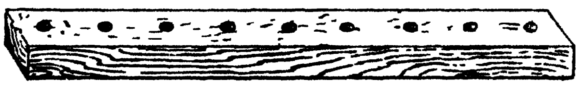


FIG. 398. Frame for making Wattle Hurdle.

holes should go right through the wood, and that the wood itself should be of some hard wood or of solid pine.

Mode of making wattle hurdle.

693. The foundation having been made, the necessary steps may now be taken for making the wattle hurdle itself, as shown in Fig. 399. Some suitable stakes should be first procured to supply the thirteen uprights required for the hurdle. Supposing it is intended to make the hurdle 3 feet 6 inches high, the stakes themselves should be 4 feet 6 inches long, in order to leave 9 inches below the wattled part at the bottom and 3 inches clear at the top. Having sharpened the stakes that are to serve as uprights, set them in the holes made in the foundation to receive them, and then proceed to complete the hurdle with rods interwoven transversely between the uprights. The best material for these are hazel and willow rods, and rods of any kind of wood that is *lissom*, as we call it in Devonshire, or supple and easily bent; and as the rods must be turned round the end stakes, in many cases it is desirable that they should bend freely and not easily break. This—the bending, not the breaking—quality is to be found in hazel, which, when bent across with the hands two or three times, and then twisted until it cracks and opens longitudinally in three or four places, is used as withes for binding up faggots of brush or other wood. When the interweaving has been completed, it is as well to nail the topmost and the lowest strand to the uprights with wire nails to prevent any chance of slipping up or down, and then, as a natural consequence, off the stakes.

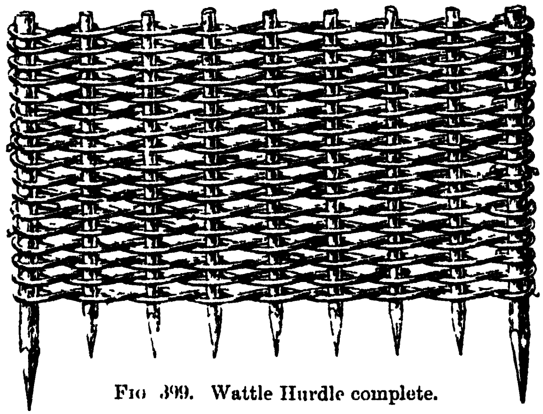


Fig. 399. Wattle Hurdle complete.

Wattle hurdle as gate.

694. If one only of the end stakes be retained to enter the ground, and the rest cut off short, the hurdle so treated may be used as a gate or means of entering and quitting the enclosure, the hinges, if I may call them so, being twisted round the pointed stake of the hurdle that is used as a gate and the end stake of the adjacent hurdle. These hinges may be formed of twisted hazel and a bit of stout cord used for tying the free stake or pointless end stake of the gate-hurdle to the fixed stake of the hurdle

Hurdles as shelters.

next to it. From their construction it will be readily seen that a row of these wattle hurdles will prove a very effective, though rough, shelter, and of great service in breaking the force of any cold and cutting wind. Short hurdles, or rather low hurdles, about 18 inches high, or even the taller hurdles, may be used for protecting early peas and potatoes, the hurdles being placed on each side of the rows against one another, meeting together in this form Λ at the top, in the position of an inverted V. Their primary use, however, is for purposes of division and separation of one small parcel of land from another, but, as they can be used for other purposes it is as well to mention the fact.

Hurdles of cask staves.

Construction of hurdle or paling.

695. Of course, very good and effective movable dwarf hurdles may be made in other ways, and one of these is to knock up rough casks which may be bought at the grocer's or ironmonger's for about 6d. each, and to use the staves as uprights, nailed to transverse bars or rods at top or bottom. The casks themselves are some larger and some smaller, and range in height from about 3 to 4 feet. The staves are rough in themselves, and the casks being only meant to contain and convey dry goods from one place to another, are rough also, and roughly put together. I have bought them one with another, large and small, for 6d. each; and when they are taken to pieces I can assure the reader that the staves yield a good sixpenny worth of wood, to say nothing of the hoops which chop up into short pieces, and in this form are handy and useful for firewood, which is always in demand in every household. The staves are not of uniform width, but they can always be sorted into two lots, broad and narrow, or even into three, broad, medium, and narrow. The first thing to be done is to release the staves, and this is best done by sawing through the hoops on the *outside* with a tenon saw. A rough hurdle or piece of paling formed of cask staves is shown in Fig. 400. The foundation of the hurdle consists of two standards or uprights, one of which is shown at A, and two transverse or horizontal rails. It is as well to nail a narrow stave on to the upright as shown, so as to cover the upright, which is indicated by the dotted lines down the stave. The widest of the staves, as at

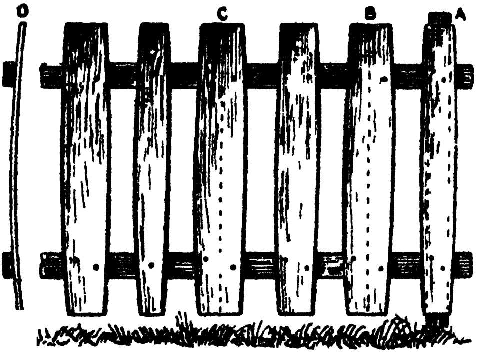


FIG. 400 Hurdles or Palings made of Cask Staves

B and C, may be sawn in half longitudinally and made into two narrow ones. The dotted lines in B and C show lines of division.

696. Although occasionally a cask may be met with in which the staves are all but straight, they are generally slightly curved, as shown in a side view of one of them exhibited at D. They should all be nailed to the foundation the same way, that is to say, all with the convex side turned inwards as in Fig. 400, or all with the concave side turned inwards. When one is put in one way, and the next one in the other, the effect is very bad. If the transverse rails are truly and squarely placed, that is to say, in such a way that the surfaces to which the staves are nailed are in one and the same plane, it is clear that when the staves are butted against them and nailed to them, the slightly convex or slightly concave surface of the stave will not entirely coincide with and touch the flat surface of the rail throughout its whole width. Therefore, when putting the uprights and rails that are to serve as the foundation of the framing together, it will be well to decide in which way the staves shall be put on, and then give the rails a very slight inclination accordingly, which may be done, if the uprights and rails are halved together as they should be, by making the halving in the upright a trifle deeper at top or bottom of the transverse cut as may be required. A mere trifle will do it, and a better bearing will be got for the staves. At D, for example, the bearing of the stave against the rail is chiefly against the lower inside edge of the top rail and the upper inside edge of the bottom rail, being put on with the convex side inwards. Had the rails had the staves nailed to them with the concave side inwards, the reverse would have been the case. But, by so making the notches in the uprights a very little deeper at top or bottom, according to circumstances, and giving each of the rails a slight cant in the requisite direction, the staves may be made to butt against the rails through and throughout the width of the rails. I trust that my meaning will be clear to all home carpenters without having recourse to an illustrated diagram.

Nailing staves to foundation.

697. Without saying anything more by way of description in detail on this part of the subject, it will be at once manifest to the home carpenter that any variety of hurdles in plain or fancy work may be made at will by first providing a foundation, and then attaching any covering matter to it to fill the space between the uprights and transverse rails. Thus, wire netting may be attached when the hurdles are more especially intended for protective purposes, such as the enclosure of any particular spot in field or garden, or when made in a narrow form, elongated to some extent to serve as a protection to the stems of young and newly-planted trees which would be

Other kinds of hurdles.

utterly spoiled if the bark were nibbled by rabbits, and others may be formed by nailing on trellis work to the foundation, or rough sticks or stakes sawn down and attached vertically or diagonally after the manner of trellis work.

Hurdles as shelters for sheep and cattle.

698. Just as netting in a garden affords protection to the blossom, etc., of fruit trees attached to walls when hung before them during the prevalence of cold and cutting winds, it is wonderful to find what an amount of protection is afforded to cattle or animals of any kind by four or five wattle hurdles, or ordinary hurdles, interwoven with pieces of furze and gorse placed end to end after the manner of a >, put into the ground in the manner just shown. Sheep, for instance, will gather together in a temporary shelter thus formed, and gain a great deal of protection from it, although full of chinks and openings, as the wattle hurdle necessarily is. It is difficult for a human being to realise this, but the fact remains. If the home carpenter be possessed of a cow or a pony, he will not, as a matter of course, allow either to remain out of doors in winter time, or inclement weather of any kind; but if he have half-a-dozen sheep, as he may have, he will scarcely drive these within doors, but will put up a shelter for them, after the manner described, in the field, orchard, or paddock in which they happen to be. Another very excellent method of affording shelter to such animals as these, is to make a rough but strong framing of wood of uprights and transverse rails, as shown in Fig. 401, about 6 or 8 feet long, and about 4 feet 6 inches in height, and to cover this framing externally with roofing felt, securely nailed to the framing, and well coated with tar – preferably with Stockholm tar within and without. The uprights should have pointed ends to them about 12 inches long, so that they may be firmly driven into the soil, and the frames should be placed together at right angles at the corner in which they meet. The structure should then be strengthened by transverse bars placed across from frame to frame as shown, dropped on to stout iron or wooden pins, projecting upwards from the top of the framework on both sides, and the whole covered in with a tarpaulin or rick cloth, or, better still, with a framing made in the same way and covered with roofing felt, which may take the place of

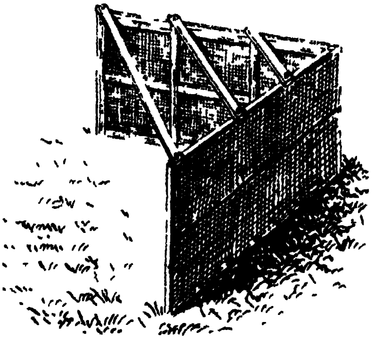


FIG. 401. Temporary Shelter of Framing and Tarred Felt for Sheep.

the transverse bars. The corner in which the frames meet should be turned in the direction from which the wind is coming. To a few sheep, or even to a small cow or a pony, it would afford an invaluable shelter. The ends of the frames may be held together by three or four bolts and nuts.

Fencing, fixed and immovable.

699. With regard to fencing—fixed and immovable—there is, after all, not much to be said. Its construction will depend entirely on the purpose it is intended to serve, and whether it is necessary to make it solid or open. It is difficult to say exactly what kind of fencing is desirable without knowing the place in which it is required and the purpose it is intended to serve; so it is not possible to do more here than to resort to hypothesis or supposition, and to cite a few cases in which fencing may be desirable, and then mention the kind of fencing that may be desirable in each case. And first let us take the case of a pond in the grounds which is pretty much exposed, and which, in the interest of young children at all events, it would be desirable to enclose and protect from frequent visitations and inroads on their part.

Fencing for ponds.

700. Now, ponds are of various and widely different forms. Some are enclosed, say on three sides, by hedges, through which, on account of the thick growth that springs from them and the trees that grow in or close to them, it is impossible to make a way. If only one side is exposed, it is a question if any fence at all is necessary. At all events, if it be deemed needful to have one at all, a few posts set by the side of the open and exposed part, with wire strained from end post to end post, will be sufficient. It is sufficient to afford an obstacle, at all events, to children. It does not prevent the entrance and exit from its waters of geese and ducks, but it unfortunately prevents cattle from getting to the brink to drink of its water if they be so inclined. Therefore I am inclined to say, leave an opening at one end or the other, or at both ends, through which cattle may pass, and fence up the middle in any way; whether by a wire fencing, or by posts and rails with uprights nailed to the rails at equal intervals between the posts. If the pond, on the contrary, be a tolerably open piece of water exposed on all four sides, or in other words, all round, or even on two or three sides, it is as well to surround it with posts and rails, nailing battens to the rails at a distance apart equal to the width of the batten, or a little more, and put in one part of it a gate whereby access may be gained to the pond itself at any time when necessary. Before the posts - which should be stout and substantial—are put up, provision should be made for the attachment of the rails, which may be notched or mortised and tenoned into them.

Jointing of rails to posts.

701. But before I go any further with the main part of my subject, namely, fixed fencing under different circumstances, it may be as well to make a few remarks on the various modes of jointing posts and rails adopted in carpentry. I have dealt with it before, I know; but it is a difficult matter in writing a volume of this extent to determine exactly where you have previously handled the particular information to which you desire to make reference, and thus it is that I feel myself compelled to resort to repetition. Now, in Fig. 402, I have given a diagram exhibiting one mode of halving and two methods of mortising and tenoning rails into posts, particularly where the ends of the rails meet at the post itself. In A, a mode of mortising is shown. The mortise is cut through the post of the width and thickness of the rails, and, the ends of the rails having been cut to a bevel, as shown, they are thrust into the mortise and brought together as closely and tightly as possible. At A′, a side view of the post in A on the side *a b* is shown, and the rails are shown in section as if they had been sawn off close to the post. In B, the ends of the rails are shown notched into the post, which is cut to a depth sufficient to receive them, bringing the surface of the rails flush with the surface of the post. At B′, a side view of the post is given and the rails in section, the right-hand side *c d* being chosen as before. In C, the mode of mortising an arris rail into a post is shown, and in C′ a side view of the post, along the side *e f*. In this a section of the arris rail is shown by dotted lines. It is reduced at the end as much as is needful, from a triangular to a rectangular form, and the mortise is cut in accordance with the tenon thus made. The tenon only goes half through the post, and is met there by the tenon of the rail in continuation on the other side. The rails may be screwed or nailed when put in place, but the best way is to bore holes through rail and post, and peg the two together with oaken pegs. In A the poles may be nailed to either side of the rails, but I have shown them as nailed to the side nearest the spectator. In B they should be nailed to the rails on the inner side, which is flush with the bottom of the notch into which the ends of the rails are laid; and in C they must, of course, be nailed to the broad vertical face of the arris rail. Having now given the home carpenter a "refresher" on these points, I need say no more about the *modus operandi* in pages yet to come.

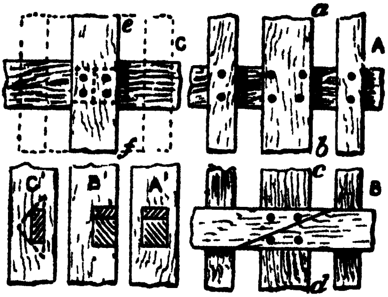


FIG. 402. Diagram showing different Modes of Halving and Mortising Rails into Posts.

702. When the posts and rails have been put up, and provision made for ingress to and egress from the pond and the margin that surrounds it, in the form of a gate, fixed between a hanging post and a falling post, from 2 feet 6 inches to 3 feet apart—unless it is considered desirable to have an opening wide enough to admit a cart, in case it is found necessary to cleanse the pond at any time, and remove the mud that will accumulate at the bottom unless a running stream finds its way into it on one side and the surplus water makes its escape on the other, as is sometimes the case—all that remains to be done is to nail up palings to the rails all round. These should be well coated with tar when the wood-work is ready for it; and the dressing over with this very cheap stuff should be renewed yearly, or at least once in two years.

Completion of paling.

703. After all that has been said the home carpenter cannot now be at a loss to put up palings of any kind. Palings are palings, and there is but one way of putting them up, although styles differ. It will depend entirely upon circumstances of situation and purpose in view with regard to height. Thus, if it be required to keep poultry within bounds, that is to say, fowls, it will be necessary to carry them to some height, say from 10 to 12 feet, and it is a good plan to carry netting round the top, inclined inwards at an angle of about 45° to the paling, supported on rods or short poles fixed to the paling itself, say to the top rail, and jutting out so as to catch the outer edge of the wire which will be fastened on the inner edge to the top of the paling with short staples. This will baulk the flight of any ambitious Chanticleer or Partlet that might endeavour to fly over. Nevertheless, there are some breeds that, being tolerably light in body, and long and powerful in wing, can fly high, and the only resource in such cases is to cut some of the longest wing feathers pretty nearly away with a sharp penknife or pair of scissors. In such high palings as these battens may be used; but the tops of fir poles, which may be bought at some of the docks, or of dealers in Swedish wooden goods, such as doors, etc., sawn lengthways down the middle, are better, and have a far more picturesque appearance. Hop poles, or poles of a similar character, which may be bought at the woodyards in towns, or of any woodcutter in the country who buys up the undergrowth in copses to sell as faggotwood, etc., may also be used.

Palings to keep poultry within bounds.

704. It may be found necessary in some cases to put up a fence across a narrow piece of ground, say from 12 to 15 feet in width, between two buildings, the walls of which are parallel to each other, as, for example, between the end wall of a barn or outhouse of some kind and the back of a lean-to

greenhouse. These I suppose to be *in situ.* Now, one plan is to knock shallow holes in the walls of outhouse and greenhouse, and having put the ends of transverse rails into the holes thus made, to fill up the openings all around the ends of the rails with bits of brick or stone set in cement, and then nail poles to the rails, making provision as before in the case of palings round the pond, by means of a gate for ingress and egress at pleasure. This is but a bad way at the best, for you cannot butt the ends of the rails securely against the inner part of the holes, unless you remove a considerable quantity of the walling above one of the holes in a direction slanting upwards, so as to force in one of the ends in a downward direction. The plan that I prefer myself is to plug the two walls, and then fasten with spike nails a substantial upright to each, with mortises cut in one to receive one end of the rails, and notches in the other into which the other end of the rails may be dropped and fastened. If a door or gate is necessary, jambs must be put up, and the transverse rail at the bottom must be cut and fitted into the jambs. It will be found more convenient in such a case as this to make the gateway on one side instead of the middle, and to have a standard or upright fixed in the ground and running up as high as the upper or middle transverse rail, so that this forms one jamb, and the standard against the wall the other. It is better always to have three transverse rails, one at the top, one at the bottom, and one in the middle, as this middle rail is always available as the lintel of the gate. But if the free jamb be carried up to the upper transverse rail, and there be only two of these rails, a short rail must be put across between jamb and jamb to form the lintel of the gate. The paling will then be completed in the ordinary manner with hop or similar poles, fir poles sawn in half lengthwise, or battens. If a solid fence is desired rough boards must be used. Netting of 1-inch mesh must be nailed along the bottom of such a fence as this if it is necessary to prevent young chickens from finding their way out and in.

Paling across narrow space between walls.

Provision for transverse rails and gates.

705. This, I think, fairly exhausts all that need be said about fixed fences in the farmyard. I have gone at length into a description of gates and stiles of different kinds, suitable for the garden and equally so for the farmstead, in the Second Part of this volume; but I can conveniently supplement what I have already said there, by describing here other forms of gates and stiles, all of which will prove useful. What I have in view comprises the ordinary stile, the wicket or swing gate, the Sussex gate, and a light and attractive style of entrance gate. Now, the first that I will deal with is the ordinary field stile, which affords access to a path field, and is

Gates and stiles of different kinds.

Ordinary field stile.

usually found by the side of a gate, in which case one of the gate posts furnishes one of the posts for the stile, the rails of which are mortised into it. In many cases, however, where the gateway into the field is elsewhere, it stands by itself, as shown in Fig. 403, and the hedge or fence, as the case may be, touches it on either side so closely that nothing can force its way between the sides of the stile and the hedge itself. The construction of the stile itself is sufficiently shown in Fig. 403. Two stout uprights are necessary, about 4 inches in width, and from 2 to 3 inches thick, both of which are mortised to receive the ends of transverse rails, about 3 inches wide and not less than 1¼ inches thick. A stool or stepping-piece, supported on stout pieces of wood let into the ground, should cross the bottom rail at right angles, resting on the top of the rail. The length of the stepping-piece should be about 18 inches, and its width about 4 inches. Now, the object of this stepping-piece is twofold -firstly, it affords assistance to those who use the pathway in getting over, and, secondly, it preserves the bottom rail from wear and tear when trodden on by those who climb over the side. Pathways are a nuisance, I know, to those who own or occupy the property across which they run; but the public have a right to them, and everything should be done to make the transit over the obstructing stile as convenient as possible.

Stepping-piece to stile.

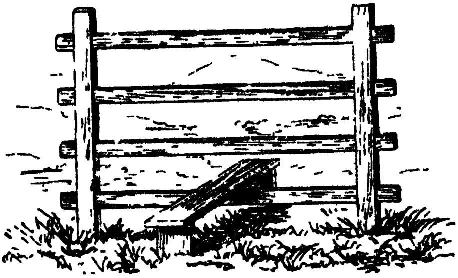


FIG. 403. Ordinary Field Stile

Swing gate or swing stile.

706. Some old curmudgeons of farmers, writhing under the injury done to grass or crops, will seek to make the transit from one field to another as difficult as possible, and make the stile as high as possible, whereas, from 3 feet to 3 feet 6 inches is quite enough, or they will bar the way with high gates securely fastened, that require a good deal of exertion to clamber over, especially on the part of women. To my mind, wherever pathways exist, the road should be made as easy as possible to the pedestrian; and therefore I much prefer a swing stile, or small swing gate, to the stile that must be climbed. A plan of this kind of gate-

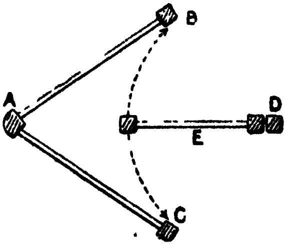


FIG. 404. Plan of Swing Stile or Gate.

stile is shown in Fig. 404. In this, A, B, and C, are three posts, which are connected by rails, as shown in the sketch view of swing stile, given in Fig. 405. Another post, firmly fixed in the ground, is placed at D, and to this a small gate, E, is hung. This gate swings backwards and forwards, and strikes against the posts at B and C, or the rails close by them. By these it is prevented from going beyond a certain distance in either direction. Any one passing through the swing stile and entering at the post B, pushes the gate towards C, and when it has reached it, enters the opening thus made for him and stands in the angle formed by the post and rails at A. He then pushes the gate, E, in the opposite direction until it reaches B, and then goes out through the other opening that is now made. The ease and rapidity by which passage from one field to another is effected, or from a roadway to a field, are great, and render this form of swing stile highly advantageous and desirable. Care should be taken not to make the angle of retirement and the gate too large. Indeed, it should not be more than just sufficient to allow one person to pass at once. No four-footed animal can make its way through a stile of this kind, and it is impossible to drive a barrow or perambulator through it. In fact, all vehicles of this kind must be lifted over it. It is a great pity that swing gates are not oftener found on pathways than they are.

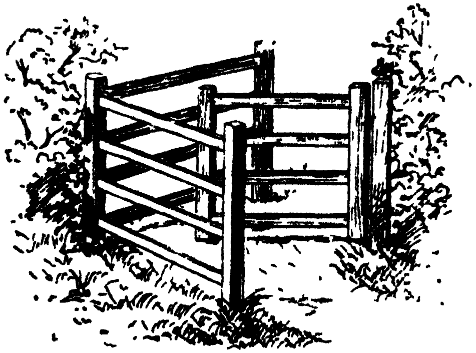


FIG. 405. Sketch View of Swing Stile or Gate.

707. From the swing gate I pass on to the Sussex gate, whose principle and construction are fully shown in Fig. 406. As field gates, when made some 7 or 8 feet long, I do not recommend or care for them, as they are so heavy and cumbersome that one must needs have the strength of Goliath or Hercules to remove one from its place and restore it thereto. But when it is made on a smaller scale, say about 4 feet, or even less, in width, from upright to upright, these parts included, it is by no means so cumbersome, and may be taken down and put back with comparative ease. It is, moreover, very handy in the place of a stile, especially where there is no gateway, and it is desirable to drive animals from one field to another. Two stout and strong side posts are first required, as shown at A and B, and through these wide mortises are cut at top and bottom, of such a size and in such a

Sussex gate: its principle and construction.

position that the top and bottom rails, C D, of the gate, which are cut of such a length as to project about 1 inch beyond the outer sides of the gate posts, may pass easily through them. The gate itself is formed of two styles or uprights, about 2½ to 3 inches wide, and about 2 inches thick, or nearly so, and five rails about 2½ inches wide and 1 inch thick. The top and bottom rails go right through the styles and project for some distance beyond them like horns. The three intermediate rails go just through the styles, but no further. It will be seen at once that the space between the gate posts and the styles of the gate should be of such a width that when the style E is pushed towards and against the post A, the ends of the top and bottom rails on the other side should come right out of the mortises in B; and so, being clear of B, should allow, when the gate is pushed a little on one side, the horns on the top and bottom rails on the other side to be withdrawn from the mortises in A. And so *vice versa* when the gate is in position, and the style F is pushed towards and against B. An advantage of these gates is that there is no iron work about them—there need not be even a nail; and so the amateur wood-worker who resides at some distance from a country town, and has no hinges, hasps, staples, etc., in store, may yet make a gate that requires none of these things, and yet is perfectly secure in itself. To ensure facility in removal, the mortises in the gate posts should be fairly large, and the tenons or horns should be pared down slightly and rounded at the edges, and both holes and horns be kept well greased. By these means friction is reduced, and the trouble involved in taking down and putting up reduced to a minimum.

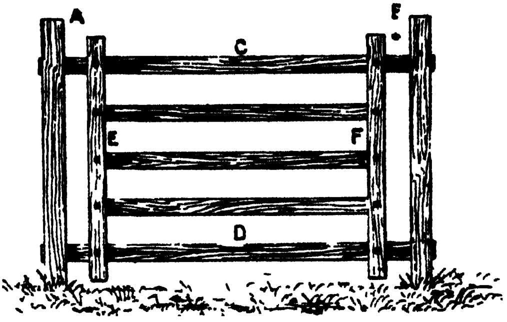


FIG. 406. Sussex Gate.

708. I spoke above of a light and tasteful way of making an entrance gate; and if the reader will take the trouble to look back to Fig. 336, in page 464, he will see the shape of the gate I have in my mind. It will be noticed that the hanging style of the gate terminates far above the top rail of the gate and bends over towards the falling style. It is desirable, for strength's sake, that it should be sawn out of a single piece of thick plank, or of a tree with a *knee* in it, such as is often found in a piece of oak. Now, suppose that the hanging style, the falling style, and the diagonal that runs from the top

of the slanting-piece to the bottom of the gate, and notches into the falling style are cut so as to be about 3½ inches wide by 2 inches thick, and are disposed so as to have the thickness on either side of the gate, and the width facing inwards; then plane down a number of pieces of quartering, 2 inches square, so as to form round bars, about 1¾ inches in diameter, or thereabout. Then, having got the other parts of the framing into position, and kept them so by nailing pieces of scantling or battens on to one side, mark carefully with straight-edge, square, and pencil, the exact places at which the rounded bars will enter and pass through the two styles, and the diagonal also. Next, bore the holes through which the transverse bars have to pass, having taken the parts to pieces for this purpose; and having done this, drive the rails through the holes in the different pieces, and bring up well together, testing the accuracy of the work with square and plumb level. The best way is to get the top and bottom rail into position first, then test for squareness and fasten up, and, lastly, put in the iron bars.

Light entrance gate with rounded bars.

709. The mode of putting on hinges and fastenings has already been described, and need not be repeated; but, with regard to the hinges, it should be said that while the topmost strap and loop is hung on a staple, the lower hinge should be formed of two independent parts, as shown in Fig. 407. In this, A is the front elevation of a horizontal plate, with two pegs rising from the upper surface, so made as to be securely attached to the hanging post. At B is shown another plate attached to the hanging style which is deeply notched to fit on to the pegs, and, being put on horizontally, works on and over the horizontal plate shown at A, and round the pegs. This is drawn in plan. The effect of this arrangement is to throw the gate on one side when it is opened, and ensures its return to the falling style by its own weight, and its closure.

Lower hinge for entrance gate.

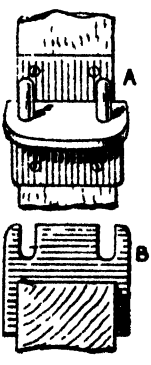


FIG. 407. Lower Hinge for Entrance Gate.

710. With regard to mending fences, but little can be said, as different fences must be repaired in different ways, each after its own sort. But mending holes in hedges is a different thing. Passage ways through hedges are generally made by poachers, trespassers, and goats. Cows and sheep seldom err in this direction unless there be a suggestive gap, and something very tempting in the way of pasturage on the other side. Never tether a goat near a hedge; for the animal infinitely prefers the trees and bushes, thorns and brambles, of which the hedge is composed, to the green grass of the field, and

Repairing fences.

if its tether be long enough it will make its way through the hedge or on to the top of it. I am speaking more particularly of fences formed of quick, or hawthorn, or privet, which have not been kept properly cut, and have got to be narrow and naked at the bettom, whereas they ought to be thick and full. The only course is to stop the gap with posts about 12 inches apart, and interlace thick rods of ozier or hazel between, after the manner of a wattle fence. Then pull the quick, bramble, brier and everything of this kind as closely to it as possible with wire. This, I think, will have the effect of stopping any further passage on the part of biped or quadruped.

711. If, however, you have reason to suppose, from unmistakable signs of the trampling of feet and breakage, that poachers and trespassers still pass that way, take steps to make things as difficult and unpleasant to them as possible. One way is to nail a rounded rail to the top of the stout posts that have been driven in, or even a flat piece of wood sufficiently wide, and plaster this plentifully with a mixture of red ochre and grease. It is this with which sheep are marked after being sheared. It is known as "ruddle and grease" in Devonshire. The next time Mr. Poacher or Mr. Trespasser throws his leg over it in crossing, he will inevitably spoil his clothes irretrievably, for the marks of the ochre and grease will never come out, and if his wardrobe be a slender one, you may, perchance, be able to spot your friend when you meet him.

712. Another good plan is to nail a piece of barbed wire along the top of the posts, or to put on a cross rail and stud it pretty freely with tenter-hooks, but tenter-hooks are things that are easily and quickly knocked down into the wood so as to be innocuous, so the best way is to resort to barbed wire. "But," the home carpenter may object, "I cannot get barbed wire, especially in small quantities, so what am I to do then?" "Why, make it!" "What! make barbed wire? surely that is impossible." "By no means, it is far easier than you think, and cannot be rendered null and void like tenter-hooks and nails in wood." Fig. 408 will show you how to proceed. Take three or four strands of pliant wire that can be easily twisted, and fasten them to a hook in a wall or door, as at A. Attach the

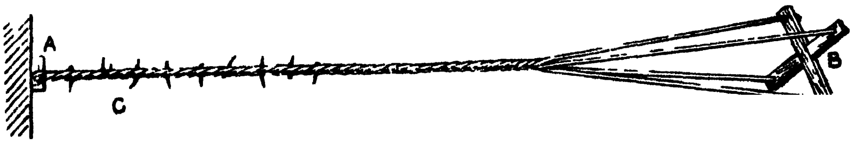
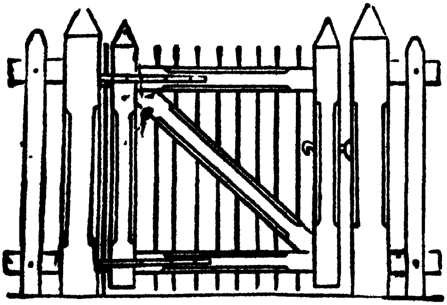


FIG. 408. Mode of making Barbed Wire at Home for Home Consumption.

Barbed wire: how to make it.

other ends of the wire to two pieces of wood nailed together crossways at B, and proceed to twist this round and round so as to impart a regular twist to the wire. Twist it tightly enough, but not too tight. When you have twisted up a length sufficient for your purpose, secure the ends next the cross, and cut your twisted wire adrift. Then, at intervals of two or three inches, drive in tenter-hooks as at C, or short nails as at D, or even staples such as are used by bell-hangers, in opposite directions, as shown in Fig. 408. You will thus have as good barbed wire for your purpose as you can buy, and the effect on intruders will be equally detrimental both to integrity of skin and clothing. Fig. 408 is placed so as to show how the twisting of the wire is best effected if the operator turns the cross himself; but the operation may be carried out with less labour on his part if the wire be hung from a hook in the ceiling, or in a beam, and a weight attached to the bottom of the cross, so that it will keep turning in one and the same direction for some time after a suitable impetus has been imparted to it to set it going.



CHAPTER II.

THE PIG: ITS DOMICILE, COURTLAGE, AND GENERAL BELONGINGS.

Repairs and Alterations of Existing Sties, etc.—Wooden Gutter—Concrete Floor to Sty—Gate or Entrance of Sliding Boards—Arrangement for Introduction of Food into Sty—Principle of Arrangement—Convenience of Arrangement—Construction of Double Pig-Sty—Isometrical Projection of Bird's-Eye Views—Material supplied by District Dimensions of Pig-Sty and Enclosure—Details of Construction—Composition of Wallplates and Rafters for Roof—The Roof and Various Materials for it—Closing up Sides, etc., of Sties and Railing in Yards—Floor of Sty and Yard—Construction of Incline or Shoot for pouring Pigs' Swill into Trough—Material and Details of Construction—Mode of fixing Shoot—Brick Trough—Wooden Trough—Dimensions and Construction—Home-made Guttering—Principles of Construction—How to finish Gutter—Down Pipe for Gutter—Tank or Cesspit for Water—Simple Latch easily lifted and closed—Pig Pail or Bucket.

Repairs and alterations of existing sties, etc.

Wooden gutter.

713. In this chapter I will deal with the pig, its domicile—otherwise briefly called its sty—its courtlage, or curtilage, and its general belongings, which naturally include its trough and access thereto. If the sty and courtlage pertaining thereto be ready to hand on the place, the owner or occupant will have nothing more to do than to see to general repairs and alterations, and to the thorough fitting of the place to its purpose. With regard to repairs it is difficult to speak, but the roof should be water-tight at all events, and if, as most likely, it is a lean-to sloping towards the courtlage, and is without a gutter or shoot for carrying off the water from the roof, a V gutter should at all events be put up under the eaves for this purpose. A V gutter is one that is very easily and quickly made. Its form is shown in section in Fig. 409. It consists of two pieces of board of the requisite length, and about ¾ inch in thickness, one 4 inches in width and the other 3 inches, nailed together in the position shown in the illustration. Some melted pitch is then run along the bottom to prevent any leakage at the junction of the boards, and the whole is then well coated with tar. It may be supported on struts, as shown, nailed to the uprights that support the wallplate in front, under the eaves or pieces attached to the wallplate itself, to which the gutter may be screwed. The water from the roof should

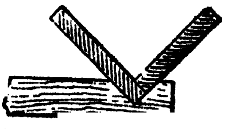


Fig. 409 Wooden Gutter in Section with Support.

be conveyed by a down pipe, and drain into a tank or cesspit specially made to receive the drainage from sty and courtlage, which will prove a most valuable liquid manure. I will speak presently about the position and construction of the tank. If an iron shoot is used it will be held up by supports to match, screwed to the face of the uprights that support the wallplate.

714. If the sty and courtlage—pig pound they call it in Sussex—be paved with pebbles, cobble stones or boulders, I strongly recommend the home carpenter to have them all out and to cover in the earth with a cement floor formed of brick rubbish, put in to a depth of about 3 inches, and then covered in with a coating of strong concrete, about $1\frac{1}{2}$ inches thick, faced with cement. This should be made to slope on either side to a gutter or depression in the middle, along which all rain or fluid matter collected in the place would drain away continually to the tank provided for its reception, which also receives the water that falls from the roof into the gutter, and finds its way thence through the down pipe into the tank. A pavement of rounded stones that present a succession of projections with deep channels between them is always difficult to clean, wherever it may be, whether in cow-shed, stable, or pig-sty. In fact, it is never thoroughly clean, treat it how you will; and that is why I so strenuously urge on the home carpenter to rid himself of the nuisance at starting. The first expense is always the least, and though it may cause a little unforeseen outlay at first, it will be found cheaper in the long run to do as I have advised at once, instead of leaving it until the doing of it becomes a matter of absolute necessity.

Concrete floor to sty.

715. To write with any degree of certainty on repairs that have to be carried out in existing buildings is not possible. All that I can say is, examine every corner and cranny and see that the fabric is as sound as it may be in every particular. See to the entrances that they are sound, whether they be of gates or boards that slide up and down in grooves. I shall presently enter on a description in detail of the erection of a pig-sty for four or even six pigs, and the courtlage in front of the sleeping places; but, before I do this, I will deal with two or three matters specially affecting the pig-sty and buildings of this class, taking, first of all, the entrance composed of sliding boards, and then with the most desirable means of emptying the pigs' food from the bucket into the trough without the inconvenience of entering the sty, or of lifting the bucket over the enclosure in order to get rid of its contents. The form and construction of the gate, door or entrance, call it what you will, of sliding boards is shown in Fig. 410; and I am inclined to give it because there is no ironwork whatever in connection

Gate or entrance of sliding boards.

with it, and no fastenings are needed for it. There is only one objection to it; and it lies in this, that from its form and make it is absolutely necessary to get over the fence that surrounds the enclosure in order to enter it, and the manure that accumulates from clearing and cleansing must also be thrown over the fence, which is conducive neither to cleanliness nor to a spick-and-span appearance,—points at which I always aim. It is said that you can readily determine what a man is from the company he keeps; you can do so equally well from the general condition in which you find his study, his workshop, his garden, and his farmstead. But now for the door or gate of sliding boards. Referring to the front elevation, shown in Fig. 410, A, B, C, D show one side of the framing in which the boards work up and down. There are two frames similar in form and construction, consisting of two uprights and two transverse pieces halved together, as shown in Fig. 411, which exhibits a section of framing and boards just above the dotted line X Y, which shows where the bottom of the board rests in the lowermost groove. The frames should not be less than 1½ inches in thickness, which is the thickness of uprights and rails throughout. The width of the upright is 3 inches; Figs. 410 and 411 being drawn on a scale of ¾-inch to 1 foot, the width of the top rail is 4 inches, and that of the bottom rail 6 inches. If they are to be set between two brick walls, they will be best made with horns projecting laterally from the top and bottom rails, which can be built into the brickwork; but if the frame is set between wood posts, horns will not be needed. If preferred, the rails may be mortised and tenoned into the uprights instead of being halved. The frames when made are nailed to, and kept apart by, two slips of wood, 1½ inches by 1 inch. Both uprights and rails are 3 feet in length. When the double frame is complete, it will be seen that there is a groove from A to X, from X to Y, and from

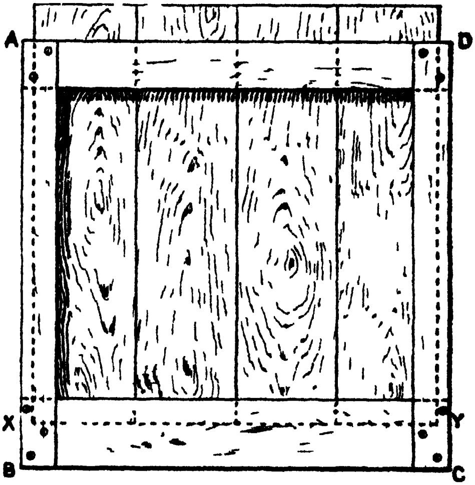


FIG. 410. Door of Sliding Boards—Front Elevation.

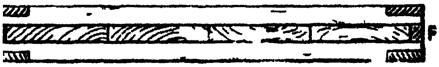


FIG. 411. Door of Sliding Boards—Section.

Y to B, 2 inches deep and 1½ inches wide, and an opening between the top rails 2 feet 10 inches long and 1½ inches wide. Four boards, therefore, 8½ inches in width, and not quite 1½ inches thick, will fill the space between the double frames, and if the edges are planed down a bit so that they will work up and down easily, no difficulty will be found in moving them. The boards should be just about 2 feet 11 inches in length, which will leave about 3 inches of the boards projecting above the top rail, and admit of their withdrawal and insertion with ease. An easy fit throughout is necessary, lest the boards stick fast when swollen by rain and exposure to damp weather.

Arrangement for introduction of food into sty.

716. The next thing to be considered is the method by which the swill, etc., can be put into the trough in the easiest and cleanest possible way. I have already shown this in one way in *Every Man His Own Mechanic*, in which the food is poured into the trough from the front, and in the very middle. In this case I will show, in a plain and simple manner, how it may be introduced from without both trough and enclosure at one end. The trough itself should be a complete and independent structure placed within the sty in the position shown in the ground plan of pig-sty given at X and Y in Fig. 412, and then fixed in such a way that the pigs cannot possibly move it out of place. I will explain the construction of the trough presently, and will proceed at once to deal with the contrivance for the introduction of the food in a manner which is clean in every way, and prevents any needless soiling of the shoes in entering the sty, or any soiling of the dress in putting the swill in, or even of the hands, if the handle of the bucket be kept clean and bright, and another handle affixed to the pail and the bottom for tilting it But I will go further into this presently. Now, the first thing to be done is to show the principle of the contrivance of which I have been speaking above, and I can best do this by aid of Fig. 412; and in looking at this the home carpenter must carefully bear in mind that it is intended to represent *principle* only and not construction.

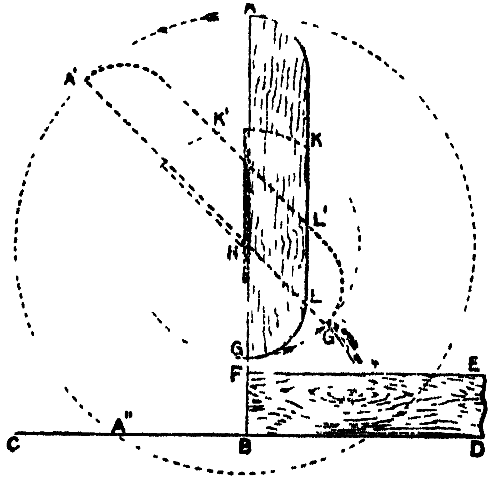


FIG. 412. Principle of Contrivance for Cleanly Introduction of Semi-Liquid Food, or Swill, into Pigs' Trough.

Principle of arrangement.

717. Now, let us suppose that A B represents the enclosure, or rather the position of the enclosure, that debars the pigs from association at pleasure with the outside world, and that C D is the ground level, C B showing it outside, and B D showing it inside; the said enclosure, B D, moreover, being the place on which, and the position in which, the trough, shown in elevation as it were at B D E F, stands. Let us next suppose that a rectangular opening is made in the enclosure from A to G, and that the opening is filled with a board to which sides have been affixed, as indicated by the shaded part A K L G. Further, that this board, and the sides attached to it, has been fixed in such a way I will show *how* presently—as to turn on hinges, or even on pivots, whose position is indicated at H. Now, it will immediately be recognised by any reader who is following me closely, that if A G be pulled from the top in an outward direction towards any one standing on the ground level B C, the point A, a point in the circumference of the outer and larger circle, will move *outward* round H, as the centre of the circle, in the direction of the arrow, and the point G, a point in the circumference of the inner and smaller circle, will move *inwards* round H, which is the centre of this circle also, in the direction of the arrow on its circumference. If unchecked in its *outward* course, the point A, on the upper end A, of the board would strike the ground level at A″; and the point G, on the lower end G, of the board would move *inwards* and upwards until it reached K, which will be found to be very nearly, if not absolutely, in a straight line drawn through H from A″ in the direction of K. If, however, some check be applied to arrest the outward and downward course of the board and its fittings at A′, the onward motion of the lower part would be simultaneously arrested at G′, and the shaded part A K L G would assume the position shown by a repetition of its form in the dotted lines A′ K′ L′ G′. The plane surface of the board indicated in profile by A G, would, in its new position A′ G′, indicate a change of place, in which it would be brought into an angle of 45° with the ground level, exhibit an incline with its lower edge G′ immediately over and a few inches above the trough B D E F, down which the pigs' swill may be discharged from the bucket, in which it has been brought to the sty, immediately into the trough by any one standing outside, with the least possible chance of getting splashed by the food, and with the least possible trouble.

718. And surely this is far better than going into the enclosure where the pigs are to give them their food, or leaning over the top of the enclosure, after having lifted over the bucket, to pour the food into the trough. And, generally speaking, pigs are so impatient for their food that they manage to

Convenience of arrangement.

stand directly in the way of the descending food, when poured in in the manner last named, so that part of it bespatters their beards, and some of it splashes off the pigs themselves, and so falls without the trough instead of within it, as it should do. If you have to enter the enclosure, things are ten times worse, for the pigs will not keep at a distance till you have filled the trough, but get round you and run up against you, pretty nearly upsetting you into the muck and mire, before you can serve up their breakfast or dinner, as the case may be, and get outside the enclosure once again. Dry food, such as waste from the garden, etc., can always be thrown in from without over the top of the enclosure, but wet food should always be poured into the trough in the manner described.

Construction of double pig-sty.

719. Now, leaving the description of the construction of the food-slide, or incline, for a while, let us consider the sty itself, and the manner of building it. Here, again, as in many other things, circumstances of position, place and surroundings, will exert considerable influence in determining the way of going to work. For example, I have given in Fig. 413 a ground plan of double pig-sty and enclosure, roomy enough for two, three, or even four small pigs in each sty; and in Fig. 414 a bird's-eye view of the double pig-sty projected isometrically on the ground plan given in Fig. 413. The method of drawing an isometrical bird's-eye view of any structure is very simple, although at first sight it may look somewhat difficult and complex. All that any home carpenter has to do, who may wish to try his hand at this kind of thing, is to make a drawing of the ground plan to scale, placing it on the paper *angularly* instead of vertically and horizontally, so to speak, as in Fig. 413, and then from each of the points indicated by the short cross lines in this diagram at their points of contact with the longer vertical and horizontal lines of the ground plan, draw vertical lines. Having determined on these lines the heights of the various parts, on the same scale draw through these points straight lines parallel to the straight lines of the ground plan, and you will

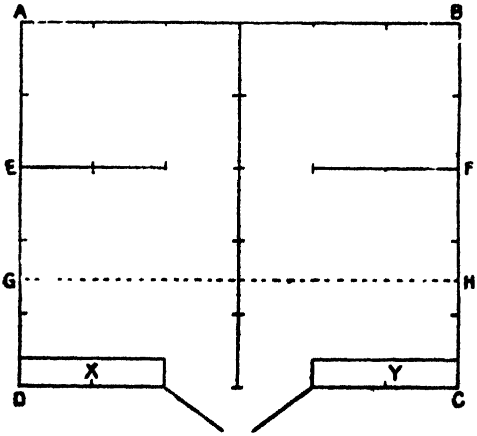


FIG. 413. Ground Plan of Double Pig-Sty and Enclosure.

Isometrical projection of bird's-eye views.

find, perhaps to your surprise, that the greater part of the work is done, and that all that remains for you to do is to insert the sloping roof lines, etc., and fill in the details. I said above that circumstances of position, place and surroundings, will exert considerable influence in determining the way of going to work. What I mean is this: if a new pig-sty has to be made, and its back, as represented by A B in Fig. 413, can be placed against another building, that building itself will supply the actual back, and save the time, labour, and trouble involved in building a new back. Again, if the pig-sty can be built in a corner, formed by the junction of two walls at right angles, as A B and B C, or A B and A D, the home carpenter will then be under the necessity of providing no more than the front and one side. These aids to building will be looked for by any careful amateur wood worker before commencing operations.

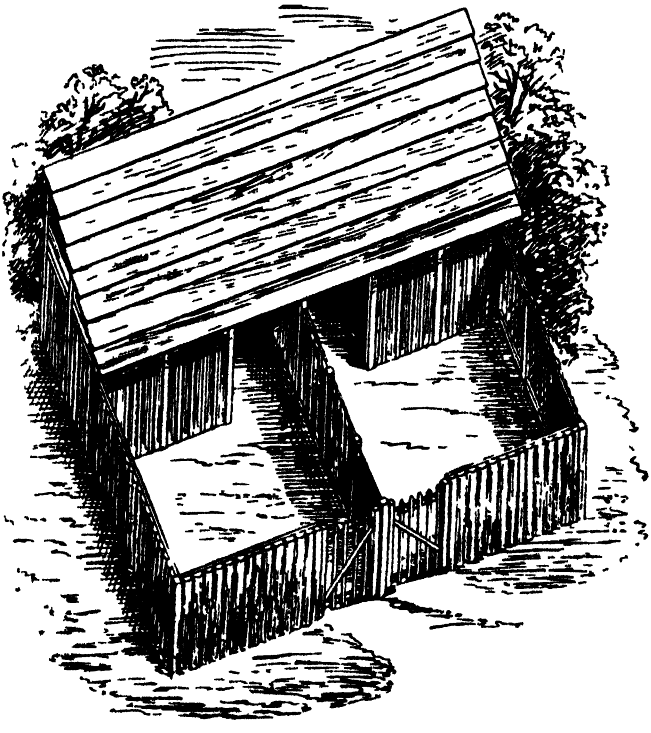


FIG. 414 Bird's-Eye View of Double Pig-Sty and Enclosure projected isometrically on Ground Plan exhibited in Fig 413

720. Again, I must call to remembrance that this is a work confined mainly to an exposition of carpentry, and that I cannot well go into other modes of building. The old Romans had certain laws relating to building operations which obliged them to take advantage of the material, be it what it may, that nature in her bounty had provided on the spot; and it is in reference to this that Horace writes:—

> Nec fortuitum spernere coespitem
> Leges sinebant——

which rendered into English is: "Nor did the laws permit them to disregard even the turf that chance might throw in their way," the moral of which is this—that in every place advantage must be taken of the material that the district supplies. Thus, in Devonshire both sty and enclosure may be formed partly, if not entirely, of the flat thin "pitching stones" that are quarried in many parts, and are set on edge in the ground. In Sussex, near the sea coast, walls are built with coarse boulders, picked up on the shore, and set in mortar. In districts where chalk abounds, buildings are formed with flints, set also in mortar. In parts where bricks are made, and can be bought at a tolerably low rate, it may be as well to build with brick, and so on; but I assume that the wood worker wants of a truth to work in wood, and so I direct him accordingly, merely suggesting that if cement, pebbles, gravel, sand, and brick rubbish can be got hold of, with lime and what is called ballast, good serviceable buildings can be cheaply run up by the wood worker himself in concrete, the composition, making, and mode of using which is given in full in *Every Man his Own Mechanic*, a copy of which every man who possesses a copy of this volume—the companion and sequel to the older book—should have, for I cannot possibly deal here with ways, means, modes and methods that may be irrelevant to working in the wood worker's leading material, namely, wood.

Material supplied by district.

721. To return, however, to Fig. 413, this has been drawn on a scale of ⅛ inch to the foot, and therefore represents an enclosure measuring 18 feet by 15 feet, of which, in the diagram, A B = 18 feet, and A D = 15 feet. Therefore, every space indicated by short lines crossing, or at right angles to the main lines of the plan, is equal to 3 feet, and so the plan itself may be very easily read, and the dimensions of every part as easily determined. And while I am speaking of dimensions, I may as well say that Fig. 414, isometrically projected on Fig. 413, may be as easily read and its proportions determined. Thus, the height of the covered sty at the back from ground to surface of wallplate on which the rafters of the roof are laid is 7 feet, and of the front to top of wallplate 5 feet, which gives a fall of 2 feet from back to front of roof, which is just about 9 feet wide. Thus, it is possible to make the entrance to the covered sties at least 4 feet in height, or even a few inches higher, which allows plenty of room to enter the sty for clearing it of litter, and even standing room at the back for any man of ordinary stature. Man or boy would have to bend his back and stoop in order to enter the sty; but I have seen, and even had to make use of, some in which the entrance was so low that it was impossible to enter it other-

Dimensions of pig-sty and enclosure.

wise than in a crouching posture, doubled up much after the fashion of the letter Z.

722. Pigs are strong heavy animals, and if sty and enclosure be made of wood it is needful to make it strong enough to endure any amount of knocking about, by reason of assaults and rushes from within. First of all, supposing that the home carpenter has to make the building all sound and all over, at back, in front, and at sides—a procedure to which I sincerely hope he will not have to resort—he must select a sufficient number of stout posts, not on any account less than 3 inches square, and not more than 4 inches square, and set them in the ground in the positions shown by the crossings of the lines: that is to say, 3 feet apart, including thickness of posts, with their outer faces all aligned along A B C D. This will reduce the distance between the posts to 2 feet 8 inches, except from the corner posts to those adjacent to it, which will be 2 feet 6 inches. Except this be allowed for and got over by making the length and breadth of the whole enclosure from 4 to 6 inches more each way than what I have allowed for it,. and working it accordingly. Now, according to our reckoning, there will be a row of seven posts from A to B, 9 feet 6 inches in length, allowing a footing of 2 feet in and below the surface of the ground; seven posts 7 feet 6 inches long from E to F: three intermediate posts from between A and E at the three points indicated between this point and that which appears midway between B and C, and thirteen posts, 5 feet in length, set round the enclosure and in the fence of partition between the two yards in front of the two sties. Frame the posts together by stout rails, 3 inches by 2 inches, either halved or mortised and tenoned into the uprights as the skill and working power of the home carpenter may determine. I have made every post about 6 inches longer than is absolutely necessary to admit of any sawing off of slices at the tops of the posts, when alternately fixed, to bring them all to the same level, or rather, when I say *all*, all posts which are intended to be of the same height, and whose tops should range at the same level. The rails, if halved to the uprights, may be halved to the outside or the inside face of the uprights, when long rails may be used; but if the transverse or horizontal rails are mortised and tenoned into the uprights, the mortises must be in the centre of the side faces of the uprights, and short pieces of the necessary length, that is to say, 3 feet, generally speaking, from centre of one upright to centre of those adjacent on either side, be used. Provision must be duly made for the halving in or mortising and tenoning of the rails before the posts are finally set in the ground. Every joint or mortise and tenon must be marked in pencil on the

Details of construction.

rails, whether long or short, and on the posts or uprights, so that everything may fall into place when the posts are set in position, and the attachment of rails to posts finally made. It is a good plan to make back, front, sides and central division in lengths on the ground and then lift them into place; but the lengths will be very heavy, and the aid of at least two or three pairs of hands will be needed to get them into place. Before filling and ramming the holes, into which the posts have been dropped, every length should be carefully tested for uprightness and proper level with plumb-level and spirit-level.

Composition of wallplates and rafters for roof.

723. I have said so much in previous parts of this volume on the construction of framed buildings, that I do not think I need say much more as to details of construction. Wallplates must be laid on the top of the line of posts from A to B and E to F, in Fig. 413, continuous throughout from end to end, and these wallplates should be as wide as the posts, and at the very least 2 or 2½ inches thick. They should be mortised and tenoned on the posts. Shorter wallplates should be laid *on and over* the ends of the longer wallplates, from side to side, of the thickness of the rafters or thereabouts. It will not be at all a difficult matter to cut the rafters to notch on to the two lines of wallplates, or to make the wallplates a trifle wider than the posts, and cut the tops of the posts at the bevel slightly in accordance with the slope of the roof, as shown in Fig. 415. In this A represents the post tenoned at the top, B the wallplate from end to end suitably mortised, and C the external wallplate or rafter, or any of the intermediate rafters that take the roof, laid on from back to front. In doing things in this way care must be taken to cut the mortises accurately, and to do this great caution must be exercised in marking them on both sides of the wallplates in accordance with the bevel or slope given to the top of the posts. The best way is to determine the bevel at each end, and then to mark with marking-gauge or chalk line, the line of tops of mortises on the upper surface, and the line of bottoms of mortises on the under surface. Then, having set your wallplate on small pieces of wood, cut to the necessary slope so as to bring the sides of the mortises perfectly vertical, you can work away with chisel and mallet, first from the upper surface and then from the under surface, vertically in the ordinary way, without much fear of coming to grief. This will, at all events, save you from notching rafters to wallplates. *Utrum horum mavis accipe*, as the old Eton Latin Grammar had it—"You can follow which way suits your fancy best."

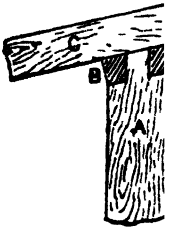


Fig 415 Mode of Mortising and Tenoning Wallplates at front and back to Posts

724. For strength's sake the rafters had better be put on from 18 inches to 2 feet apart. If tiles are used for the roof, which gives a very nice appearance and finish to the roof—or slates, as you would do in Devonshire and parts of Wales —battens, whereon to hang them, must be nailed to the rafters at suitable distances from end to end of the roof. Corrugated iron, galvanised, which forms a very useful covering for buildings of this sort, may be bought in sheets of the necessary length, or, at all events, in sheets that will together make the necessary length, either new or second-hand. The sheets are sold second hand at a low price, sufficiently good for work of this kind at various places in London, and very possibly at various places in the country too. If purchased at first hand, your ironmonger will give you the price and procure them for you. Thatch is not to be thought of for buildings of this kind, although it has this merit that it is warm as a covering in winter and cool in summer. If the amateur wood worker sticks to wood, he must either use feather-edged boarding, or boards laid on lengthwise from back to front, with slips nailed over the joints to keep out the weather. In this case the actual rafters will be few and far between, but of greater strength and substance than the ordinary rafter for tiling, slating, or feather-edged boards; but transverse rafters must be imposed on the principal rafters to which to nail the boards, arranged vertically as it were, or parallel to the ends of the roof, from front to back. If boarding of this kind is resorted to, the home carpenter may cover it from end to end, and from back to front, with roofing felt *before* nailing on the slips; but roofing felt under any circumstances, when used as an external covering, has a rough and shabby appearance. The home carpenter may, however, lay it over the secondary transverse rafters, immediately under the boards, and tar it well within the sty once every year. This procedure will aid in keeping any building, in which animals are housed and kept, sweet and clean, and keep away insects that generally congregate in the corners and by the rafters in a roof.

The roof and various materials for it.

725. Too much care need not be exercised in nailing up boarding over the openings between the rafters at both ends of the roof, and at back and in front, provided the roof hangs over, or projects a little beyond, the outer edges at ends and front. At the back, however, it is as well to close up any openings. By doing this, means for ventilation will be provided which would be closed and prevented if every opening were blocked up. The enclosures which serve as sties or sleeping-places should have stout gravel boards of some thickness, and entering the earth to the depth of 2 or 3 inches, nailed on within and without all round. Then the back,

Closing up sides, etc., of sties and railing in yards.

if there be any back—that is to say, if the back be not supplied by some other building—should be boarded up with thick boards vertically disposed, with broad slips nailed over the joints to keep out the weather. The front of the sties, entrances excepted, should be closed up, as shown, although in some sties that I have seen, the front is left open from end to end. The enclosures in front of the sties proper may be closed in by rails of some stoutness, vertically disposed. A very nice and semi-rustic appearance is imparted to buildings of this kind by forming the back, when requisite, sides and front of sties with lengths of fir or beech, sawn in half longitudinally, with the bark on, nicely fitted together at the joints, and nailed on as closely and tightly as it is possible to get them. It will be urged that, as the poles are tapering in form —that is, wider at the bottom than at the top there must always be an open, and therefore imperfect, joint between every pole and its neighbours at the top. This, however, may be obviated by slightly planing the edges with a jack plane, to bring each pole to its narrowest width throughout, or every other pole may be turned so as to bring the broad end at the top and the narrow end at the bottom. In either case it is as well to bring the edges of the semi-poles as closely together as possible by trimming the edges on both sides with the plane. Semi poles of the same kind may be used for the rails of the enclosed yards, disposed at equal distances—say with interstices of 2 inches between adjacent poles. Care should be taken to get the semi-poles upright and at equal distances, by dividing out the spaces between each pair of posts, and fitting the centres of the vertical rails at top and bottom to these equi-distant marks. A thick gravel board should be nailed along the bottom of the posts, within and without, and covered in with other pieces of board between the posts. This will form a good substratum on which to butt the bottom of each vertical rail. The gates speak for themselves, and nothing need be said about them or their construction, or the mode of hanging and fastening them, as gates and their fittings have been so frequently described in other parts of this book

Floor of sty and yard.

726. I must, however, give the home carpenter a few words, by way of a reminder, about the floor of the sty and the yard in front of it. It may be made either of brick paving or of concrete, but preferably of concrete. It should be formed by removing the soil within to the depth of 3 inches, and filling up the depression thus formed with brick rubbish and other similar waste material well rammed together. On the top of this, when it has been grouted in by pouring semi-liquid cement and sand or small gravel over it so as to fill the interstices, a coating of sound and good concrete

should be laid, about 1½ inches in thickness. Within the sty this should be formed so as to slope from E A, A B and B F, and the central partition towards the entrance of the sty in each case. Then it must slope again from the line E F to the line G H, along which runs the gutter that traverses the two yards from side to side. Further, this gutter should slope from G to H, or from H to G, throughout its entire length, so as to carry off the drainage of both sties and yards in front of them. It should, in fact, slope in the direction of the cesspit destined to receive the drainage of the sties, and which may be made outside either at G or H, as may be found convenient. And lastly, the concrete flooring should slope from C D precisely in the same manner towards the gutter. This is all that need be said with reference to the construction of the floor. The home carpenter had better get some one accustomed to the work to carry it out, as he may find some difficulty in doing it himself, exactly as I have described it, and as it ought to be done.

727. We may now proceed to consider the construction of the inclined plane or shoot, down which the food for the pig is poured from without into the trough itself. The principle of this was explained, as the reader will remember, in Fig. 412. In Fig. 416 the manner in which it is made is fully shown; its appearance from within, when not in use, and therefore fixed in its place, and entirely closing up the opening in which it moves, being exhibited at A; its front elevation, as seen from without, at B; and its side elevation at C. Further, the way in which it is fastened to a support by hinges, and the means by which it is prevented from moving in an outward direction at the top, and in an inward direction at the bottom, is shown at B and C. Its setting or fixing depends altogether on the kind of enclosure that the home carpenter has adopted for surrounding the yard in front of the sty proper, or sleeping place. If it be a wall of either brick or concrete that is put up round the yard, the shoot or slide must be placed in a frame

Construction of incline or shoot for pouring pigs' swill into trough.

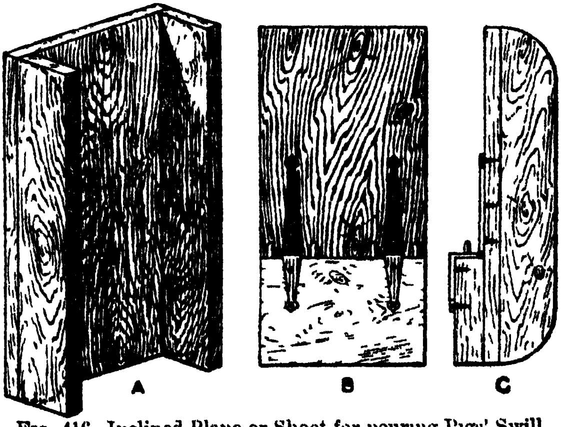


FIG. 416. Inclined Plane or Shoot for pouring Pigs' Swill into Trough from without.

that is built in the brick or concrete wall in the usual way, and the projecting piece at the bottom, to which the shoot is attached by hinges, and in which projections are fixed to prevent motion beyond an angle of 45°, is shown at B and C. In case of a frame built into a wall of any kind, the broad bar to which the shoot is hinged must extend from side to side of the opening, and be screwed to the lower rail and to the side pieces of the frame. If the enclosure be formed of pitching stones of considerable size set on end in the ground, the shoot must be properly set in a frame consisting of two uprights, the lower ends of which are set in the ground, with cross rails halved or mortised and tenoned into them at the proper places.

Material and details of construction.

728. The shoot itself, an inner view of which is shown at A, is made of $1\frac{1}{4}$-inch board, preferably of elm, but of any hard wood or even good sound pine, if the home carpenter has, or cannot get anything better. I say preferably of elm, because elm withstands and resists the action of water better than any other kind of wood. Looking at A, in Fig. 416, it will be readily understood by the home carpenter that if the enclosure be made of wood, the front corner post of the enclosure will furnish one upright of the frame, and another upright must be placed at an interval of 12 or 14 inches, which will be about the width of the shoot. We will take the width of our shoot at 12 inches, its length will be just about twice its breadth or 24 inches. The first thing to be done, after planing up the main piece, will be to get out a couple of pieces for the sides, which must be of the same length, and from $3\frac{1}{2}$ to 4 inches in width, and these must be securely attached to the edges of the back, as shown in A and C, by screws. This done, the edges or corners of the sides, which are shown in full in A, must be rounded off, as shown by the dotted lines in A, and in the side elevation at C, in which they are supposed to have been removed.

Mode of fixing shoot.

729. The shoot being temporarily secured in a vertical position so as to block the opening made in the enclosure for its reception, and to fill it completely, but yet to move easily within it, and not to fit too tightly, a projecting bar, shown in elevation at B, and in section at C, must be carried across the lower part of the shoot. This will, of course, in some circumstances, be longer than is shown in the illustrations, especially where the ends on either side must overlap the framing in which the shoot is set, and be screwed down to it. The hinges that are required for attaching the shoot to this bar are what are technically known as "box" hinges. Their form will be fully recognised on reference to C, and the manner in which they are fixed, and how they act. As soon as they are screwed, both to bar and back of

shoot, the shoot itself will move, or may be moved, outwards and inwards. The framing in which it is set should be so regulated that the lower edge of the shoot just clears the end of the trough, as indicated at G in Fig. 412. It should be fitted with a looped iron handle, similar to a latch handle, some 3 or 4 inches from the top, so that it may be readily pulled out when necessary, and as easily put back into place. A knob will answer the purpose as well, but I think an iron handle of the kind just mentioned is preferable. The shoot may be fastened up, when not in use, by buttons attached to the frame and moving over the top edge of the shoot so as to retain it in its place, or by two small bolts attached to the outer surface of the shoot, at a little distance from the top, and working into sockets fastened to the frame. I think that the home carpenter will now find no difficulty in making and fixing the shoot for the easy pouring of swill into the trough that I have so earnestly recommended to his attention.

Brick trough.

730. I may as well now dwell for a short time on the construction of the trough itself, which, as a matter of course, the home carpenter will make for himself. Iron troughs are sold, which are purchased by farmers and others who do not mind contact with the litter and mire that befouls the yard within. Another very useful kind of trough may be formed of bricks, of the shape shown in Fig. 417—bricks which are set together side by side until a trough of sufficient length has been formed. I am not at all sure as to the dimensions and proper proportions of bricks of this description; but if the home carpenter be desirous of learning more about them, he will get all the information he may require by going to any brick-yard or yard where builders' materials of all kinds are shown and sold. I think, however, that he will be more inclined to make a trough for his own use, and to this end I give him a sectional view as well as an end view, as seen from within, of a form of wooden trough well suited for this purpose, in Fig. 418. This should be made of elm boards, from 1 to 1¼ inches thick. The length must depend entirely on the will of the maker. Looking at Fig. 418 it will be seen that the spaces occupied by the trough are 6 feet long and a little more than 12 inches wide, but it by no means follows that a trough is to be 6 feet in length. From 3 feet 6 inches to 4 feet is long enough for any trough, and the home carpenter should not attempt to make one longer than this, for the longer the trough the greater the expanse of bottom over which the food will have to spread, and this is why the trough should be narrower at the bottom,

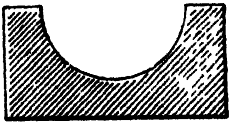


FIG 417. Hollowed Brick for making Pigs' Trough.

Wooden trough.

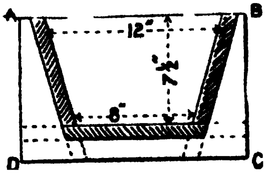


FIG. 418. Sectional and End View from within of Pigs' Trough

Dimensions and construction.

and of the shape shown in section in Fig. 418. In this diagram, A B C D represents one of the end pieces, which should be about 16 inches long, 10 inches wide, and from 1¾ inches to 2 inches thick. I should, myself, prefer the greater thickness named, because these end pieces must be deeply grooved, say to the depth of ⅝ or ¾ inch for the reception of the ends of the boards of which the trough is formed. The course of the grooves is shown by the dotted lines. Saw cuts should be made through the lines with a tenon saw when they have been marked in pencil on the ends, and the home carpenter will find it easier to take out the three grooves throughout their entire length, as the parts shown by the dotted lines can be easily filled up when the other boards have been inserted, and the trough is made. The diagram exhibited in Fig. 418 is not drawn to scale, but we will take it that the width at the top of the trough, internal measurement, is 12 inches, the width at bottom 8 inches, and the depth 7½ inches. I may say, however, that 6 inches is amply sufficient depth for the trough, and a width of 6 inches at the bottom, in which case the height of the end pieces may be reduced from 10 inches to 8½ inches, but the home carpenter can easily make a working drawing to scale, and fix dimensions to his own wishes and requirements. The boards themselves should be of elm, from 1 to 1¼ inches thick. The side boards must be bevelled at the edges to the proper inclination, but there is no occasion whatever to do this to the bottom board, as shown in Fig. 418. It may, indeed, if the maker choose, extend along the entire groove from side to side of the end piece, but there is this to be said against the adoption of this course it would be a waste of material. Put the bottom board, when ready, into the grooves in each end piece, and nail it well up through the end pieces. Nail on temporary slips to the end pieces to preserve their parallelism, and then drive down the side boards along their respective grooves until they butt firmly against the bottom board. Nail the end pieces to the ends of the side boards, as was done with the bottom board, and then having marked the bottom board on the outside to show the lines within which the screws shall come, screw the bottom board firmly to the edges of the side boards, and the trough is finished. It will be found to be a heavy piece of work when done; but the heavier and stronger the better, as it will stand all the more knocking about. It should, however, be fixed in position, as if it got shifted, the shoot by which the swill is shot into it would be of no use until the trough had been put in its place again.

731. The pig-sty must be furnished in front with a shoot or gutter to receive the water from the roof, and to convey it by means of a down pipe to the cesspit or tank that should be formed for the reception of the drainage from the pig-sties. Possibly the home carpenter may wish to make his own gutter, and yet not care about the very plain, not to say ugly, appearance of the **V** gutter. I will, therefore, now show how I have made gutters which, while serving every purpose for which things of this sort are intended, present an appearance sufficiently ornamental to improve any building of wood, and to redeem it from the reproach of being unattractive from the plainness of its construction. Now, in Fig. 419, A B, C D, and E F are three pieces of quartering, equal in length, breadth, and thickness. The lowest of the three, A B, is halved, or mortised and tenoned, on to the uprights that support the roof in front. The next in order, usually the middle piece, C D, is cut in a diagonal direction from end to end. I have had to show this in exaggerated proportions, as far as length is concerned, in order that my meaning and the principle of construction may be fully understood. By cutting C D in this manner a gentle slope is imparted to the gutter throughout its length, sufficient to carry along the water and prevent any lodgment, unless it be caused by an accumulation of dirt and leaves which will choke any gutter or shoot, no matter what may be its capacity, size, and shape. The lower part of C D is nailed on to A B, and by covering in the mortises and ends of the tenons effectually prevents any soakage which might tend to the injury of that part of the structure. On to this lower part of C D is nailed a broad board G H, shown longitudinally and

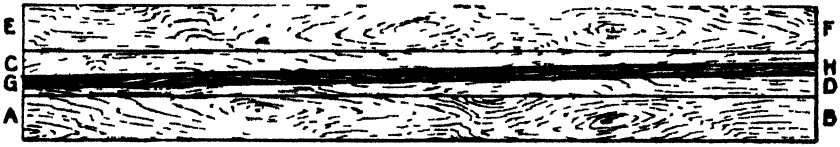


FIG. 419 Diagram showing an Exaggerated Elevation, etc., of Formation of Gutter.

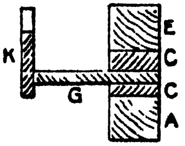


FIG. 421 Section of Gutter, etc

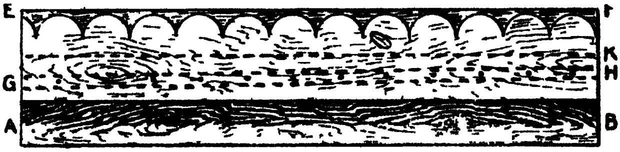


FIG 420 View of Gutter with Crestboard screwed to Front Edge

Home-made guttering.

Principles of construction.

exhibiting its position in Fig. 421. This board, as I have said before, gently slopes from end to end, and forms the bottom, or if I may put it so, the floor of the intended gutter. The upper part of C D is nailed on to this, and by this means a level surface is again obtained. Now, it will be plain enough to the home carpenter that if the rafters of the roof were notched on to this, there would not be sufficient depth at the end H of the floor-board of the gutter to receive the water that might be suddenly poured into it during a very heavy shower, or heavy and continuous fall of rain, and an overflow into the interior of the building would in all probability be the result. To obviate this, therefore, and to give sufficient depth to the gutter throughout, an additional piece E F is nailed on above, along the upper surface of C D.

732. So far, then, the gutter is formed; but it is manifest that it must be provided with a front in some way, and we must see how this may best be done. But before going on any further let me urge on the home carpenter the necessity of laying on a very thick coating of thick white paint, well mixed and amalgamated with white lead, along each surface, prior to nailing another layer on top of it. This causes the successive layers to adhere closely together, and to prevent leakage. Provision for the front of the gutter is then made by cutting out a piece of crest-board, K, and attaching it in the manner shown in elevation in Fig. 420, and in section in Fig. 421, to the outer edge of G H, whose position is shown in Fig. 420 by the dotted lines running along the front of the crest-board. It is as well to make a slight groove in K along the inner surface from end to end to receive the edge of G H, to which K should be securely screwed, after the groove in K and the outer edge of G H have been dressed with white paint and white lead to ensure a joint as impervious to moisture as it is possible to make it; and even after this it will be desirable to plaster white lead thickly along the outer and inner edges of the flooring of the gutter to prevent any chance of leakage. It can be easily seen that a gutter thus formed presents an ornamental appearance owing to the ornamentation of the upper edge of the front board. The ornamental effect may be still further enhanced by attaching parallel slips of mopstick moulding to the outer face of the front board from end to end, placing the upper strip along the top dotted line in Fig. 420, which is introduced to define the position of the upper edge of C D. A space of about 2 inches, or a trifle more, may intervene between the higher and the lower strips. In front boards where more room can be given between the two strips, a zigzag moulding may be introduced with good effect, or the slips of moulding may be dispensed with, and a zigzag moulding only put on, or a

How to finish gutter.

"key" moulding, if the home carpenter has the patience and time to deal with it.

Down pipe from gutter.

733. Finally, provision must be made for stopping each end and providing means for the escape of the water which trickles from the roof into the gutter by a down pipe. The mode of doing this is shown in Fig. 422, which, with the exception of the piece used to block the outer end, shown at L, and the down pipe at M, is a fac-simile of Fig. 421, and of the same size. The floor of the gutter and the front crest-board will perhaps have to be extended beyond the length of the combined wallplates, especially if it be sought, as in the case of the pig-sty, to carry the water to the ground *outside* the enclosure, and measures must be taken accordingly to nail a piece of wood on to the ends of the wallplates, above the floor of the gutter, to provide for this. Otherwise, when the down pipe is to pass down *in front* of the building, and parallel and close to the end towards which the gutter slopes, all that is necessary is to insert a stout block of wood butting closely against crest-board, floor of gutter, and combined wallplates to stop up the end, and then, after making a hole through the floor-board with a centre-bit, to insert a 1½-inch or 2-inch zinc down pipe sufficient to take off the water. The edge of the surface thus made should be recessed in order to receive the flange which must be attached to the top of the down pipe. Precautions must again be taken against leakage by a plentiful use of white lead.

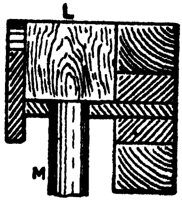


FIG. 422. Down Pipe from Gutter.

Tank or cesspit for water.

734. I have said that a cesspit or tank should be constructed close to the pig-sty on the side towards which the gutter and that which runs through the centre of the yards slope, in order to receive and store the water that comes from one, and the drainage that comes from the other. The entrance of the rainfall into the same pit or tank need not be objected to in any way, for liquid manure should never be used too strong, and accumulation to overflow may be prevented by constant use of the liquid manure which may be withdrawn from the tank by the instrumentality of a small pump. A cesspit or tank, 3 feet square and 6 or 7 feet deep, will hold a very large body of water. It should be formed, or rather lined, with good sound bricks set in cement, and well pointed in cement, or even heavily faced with cement, to prevent leakage. Another way would be to take out or excavate a larger space than is required for the tank, and to form both bottom and walls of concrete. This is easily done, and would, I think, furnish the very best means that could be adopted for its construction. Short

drains to the tank should be constructed to convey the water from the down pipe and the drainage from the pig-sties, which should be furnished with gratings and properly trapped. When the tank has been brought pretty near the level of the ground, it should be furnished with a curb, inside which should run a thick framing of wood, to which a trap door, commensurate, or very nearly so, with the size of the tank, should be attached by hinges, so that if pump or drains become choked they may be the more easily seen to, and the tank cleansed when necessary. Moreover, this will facilitate the reduction of fluid in the tank by dipping out water if the pump gets out of order, and liquid manure be wanted for any purpose in a hurry. Perhaps it would be better to dispense with hinges altogether, merely dropping the trap door into the surrounding framing. It may be more easily lifted from its position by aid of an iron ring which should be sunk below the surface of the wood to prevent any one from catching their feet in it and falling.

735. I will bring this chapter to a close with hints and instructions on two or three other subjects which must receive notice at one time or another, and may as well find a place here as elsewhere I have been led to think of it because, when I was a boy, I remember that our pigs were allowed to wander at pleasure in the yard in which were the "pigs' looses" and "cow linhays," as they were termed in Devonshire, and turned into their sties when the cows were milked in the afternoon, the doors of the sties being secured by a wooden bolt and wooden staples such as are shown in Fig. 423. The illustration speaks for itself, and fully exhibits the mode of construction, which is very simple. First of all three wooden staples are made of the form shown, and a strong wooden bolt which is moved backwards and forwards by a block of wood projecting from the bolt itself about the centre. When all the parts were ready, the bolt was placed in position, and the staples were screwed -two to the door itself and one to the falling post—after having been fitted on over the bolt, and so fitted that the bolt might work backwards and forwards easily within them. It was a rude contrivance, but it is useful to know how to make a bolt of this kind; and many a colonist, perhaps, will be glad of the knowledge, even if the home carpenter does not think it worthy of adoption. It serves to show how, in rural districts in the west country, farmers and others were enabled to fasten

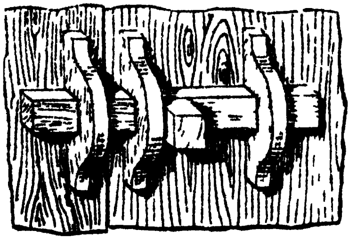


FIG. 423 Wooden Bolt to secure Doors of Pig-sties and other Doors on the outside.

in their cattle at nightfall without having recourse to the ironmonger for bolts, bars, and locks, by a very simple contrivance which was soon made by the village carpenter.

736. The next contrivance I have to show is a latch, which I have used to open and close doors of communication between fowl runs made in an old but long cow linhay or shed. The construction of this is shown as readily by Fig. 424 as that of the wooden bolt was by Fig. 423. The doors were wired doors, the wire netting being strained on broad styles and rails. The latch was screwed at one end to the centre of the style, and the free end fell into a wooden catch screwed to the falling post. A hole large enough to admit of the insertion of at least two fingers was made with a centre-bit in the centre of the falling style, in the position shown, and by this means the latch was easily lifted. The latch, when the door was opened, was prevented from falling below the level at which it is shown in the illustration by means of a couple of dresser hooks, screwed into the falling style, one on each side of the hole, and when it was necessary to close the door, the latch, which moved easily on the screw by which it was attached to the rail, readily moved up the slope of the catch and dropped into its place. Another mode of preventing the latch from dropping below its level, consists in passing a string through it and bringing it through the falling style to the other side of the door to which it is fastened by a clout nail. I have, however, found the hooks a stay and support to keep the latch in place sufficient for all practical purposes.

Simple latch easily lifted and closed.

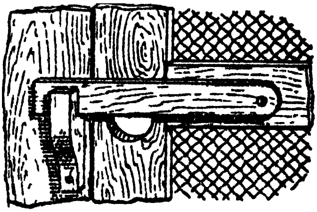


Fig. 424 Simple and Easily Opened Latch.

737. There is now only one thing left for me to touch on in connection with the pig, and that is the pig-pail or bucket in which the swill is conveyed to the sty, and whence it is poured down the shoot into the trough. Oaken pails, bought of the cooper, or of the dealer in turnery, are somewhat expensive; and the home carpenter will do well to provide himself with some half dozen or more American larch pails, which he can buy of most grocers for 4d. or 6d. each. The worst thing in connection with these pails is the slender wire handle, bent at the ends, so as to catch into two sockets of metal that are screwed, or otherwise fastened, to the pail. They are bound to come off sooner or later, so it is as well to dispense with them at once, and substitute regular pail handles of iron, that are used for coopers' pails, or a handle of strong wooden hoop, put on as shown in Fig. 425, and

Pig-pail or bucket.

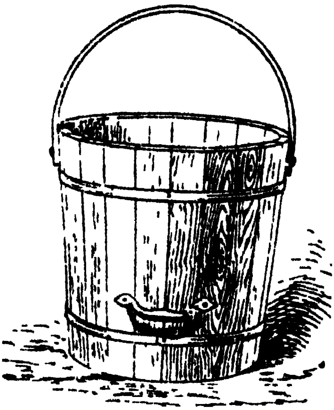


FIG. 425. Pig-pail or Bucket

securely screwed to the pail. This handle serves all very well for carrying and lifting the pail, but when it comes to tilting or tipping it so as to pour the swill down the shoot, you must of necessity catch hold of the bottom of the pail when you have lifted it, in order to do this. Now, the bottom of the pail, being the part on which it stands, is sure to be more or less dirty, and it will be found to be convenient to have a handle screwed to the pail in the position shown in the illustration. If a handle cannot be got, a ledge of wood about 1½ inches wide and 4 inches long, rounded on the inside to fit the pail, will do equally well. By aid of this the pail can be easily tilted without soiling the hands. The swill will in all probability be kept in a cask, placed near the back door, but it should be used up as quickly as possible and not allowed to accumulate for days and turn sour. Ladle it into the pail with a dipper. The pails themselves should be kept clean by washing them out when done with, and setting them upside down on a rack of bars so that the stiff handle may pass down between them. The hoops are rather weak, but, notwithstanding this, the pails last a long time. Paint them green, and the hoops and iron handle near the bottom black, and put your initials on them in white relieved with black. Do not paint that part of a *wooden* handle by which you lift and carry the pail. So much, then, for the pig, his housing, his maintenance and cleanly keeping.

CHAPTER III.

THE RABBIT AND ALL THAT PERTAINS TO ITS LODGING AND KEEPING UNDER CLOSE RESTRAINT AND SEMI-RESTRAINT.

The Ordinary Rabbit Hutch -Rabbit Hutch in Three Tiers -Scale of Working Drawings—Dimensions of Entire Structure Construction of Triple Rabbit Hutch—The Carcase -The Back The Sides and Floors of the Compartments—Linings and Drainage of the Floors- The Divisions between Compartments—Preparation for Fixing Divisions How to make the Divisions—Marking and Cutting out Partition in Topmost Hutch—Communication between Compartments—Fixing Partitions—Alternative Plan - Stand or Stool for Hutch Connection between Rails and Leg at Top—Construction of Down Pipe Construction of Front Small Doors -Wired Doors—Reason for Position of Floors Rabbit Trough Simple or Subsidiary Rabbit Hutches—Mode of Making Simple Rabbit Hutch—Stand for Simple Rabbit Hutch—Large Hutch for Young Rabbits Form of the Legs of the Hutch Rabbits under Semi-Restraint—Rabbit Pit Its Formation Construction of Shelter over Rabbit Pit—Construction of Roof of Shelter Containing Walls of Pits- Trap Hutch in Side of Pits—Cesspit for Catching Drainage - Fruit Tree near Pits Ready-made Fronts for Rabbit Hutches -Wood Hutches with Compartments

738. FROM the pig pachydermatous I will pass on to consider the rodent rabbit, and how best to form and fashion hutches in which it may be kept under close restraint, and pits in which, although it is still under restraint, it may, nevertheless, enjoy semi-freedom.

The ordinary rabbit hutch.

739. I am not going to trouble the home carpenter, or my readers generally, with a description of the ordinary rabbit hutch, which any one can extemporise out of any wooden box of sufficient size that may be bought at the grocer's. Its stereotyped form is well enough known to them all. A division with a hole on one side is first made and put into the interior to divide it into—may I say—sleeping-chamber and living-room. The former is then provided with a rough door, attached to the side of the box, generally speaking, with leather hinges, and fastened with a button roughly and rudely fashioned out of wood, and attached to a vertical piece of wood, nailed to the edges of the box above and below the division, and to the division itself. Then comes the door of the living-room attached and fastened in the same way. It is usually a frame, with vertical bars of wood nailed to it either on the inside or the outside, it matters little which. Sometimes it is of sufficient thickness to enable the maker to bore holes in the top and bottom rails to take stout iron wires: but in such doors as these, the wood

of the frames is frequently gnawed from the edge to the iron bars, and the door is virtually spoilt. A few holes are sometimes bored in the bottom to secure drainage and—there's your rabbit hutch. We will aspire to something better than this- something that is well and solidly made, and will stand inspection. I will introduce mine at once to the notice of the reader, and show him how I made it.

Rabbit hutch in three tiers

740. Accordingly in Figs. 426, 427, and 428, I give the home carpenter a complete key and thorough insight into the construction of a rabbit hutch in three tiers that I made for my own use, and which I find to be useful and serviceable for the purpose in view. Now, it is very likely that many of my readers will be inclined to demur to this "three-decker" form of building on the score of drainage, and say that although it may be all very well for the occupant of the topmost hutch, it must be anything but comfortable and cleanly for the tenants of the middle and bottom hutches. In Fig. 426 I have given, as they may perceive, the front elevation of my triple hutch; in Fig. 427 a view, also in elevation, of the partition between the two compartments of each hutch; and in Fig. 428 the end elevation, that to the right of the whole affair as you stand in front of it being shown. The other end is precisely the same, but reversed, and without a down pipe. An elevation of the back is unnecessary.

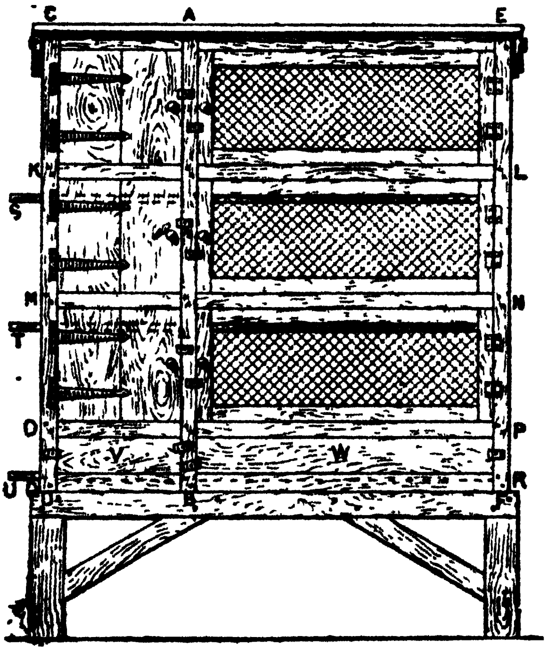


FIG. 426 Front Elevation of Rabbit Hutch in Three Tiers.

Scale of working drawing.

741. Now, firstly with regard to the scale on which Figs. 426, 427, and 428 are presented to the reader. A scale of 2 inches to the foot would produce a working drawing four times as large every way, as far as linear measurement is concerned, of the illustration before him; and

a scale of 3 inches to the foot, one of six times the size, and he would find neither of these in any way too large.

742. In accordance with the scale on which the illustrations are made, namely, ½ inch to 1 foot, the entire structure is 4 feet 10 inches in width, and the same in height, including the top, which laps over in front, at the back, and at the sides, and is 5 feet 1 inch long, or 61 inches; it is more convenient to measure by inches, so let us say that the height and width of the whole triple hutch is 58 inches, which gives a lap to the top of 1½ inches on each side, and 30 inches wide, the width of the ends being 27 inches, with a height in front of 57 inches, and at back of 52 inches, not including the boarding at top, which is made of 1-inch stuff. Now, all the rails and styles in the structure are made of battens, 2 inches wide and 1 inch thick, and this renders the height and width of the doors more easily determinable, for the joint width is 58 - 6 inches = 52 inches, and the joint height of the doors is 58 - 16 inches = 42 inches. Now, as the doors are of equal height, and there are three of them, their height is at once determinable, and therefore the height of each is 42 ÷ 3 inches = 14 inches. But as the two doors are of different widths, we are compelled to measure one of them. Taking the smaller door, and testing its width by measurement, we find it to be 15 inches, therefore the width of the larger and longer wired door is 52 - 15 inches = 37 inches; and this will be found to be in accordance with the measurements according to scale. Theoretically, this is all right enough, but when making his doors and fitting them into the openings in the framing, the home carpenter

Dimensions of entire structure.

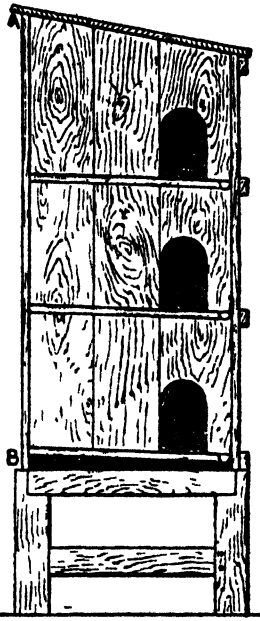


FIG. 127 Division between Compartments of Hutch in Elevation.

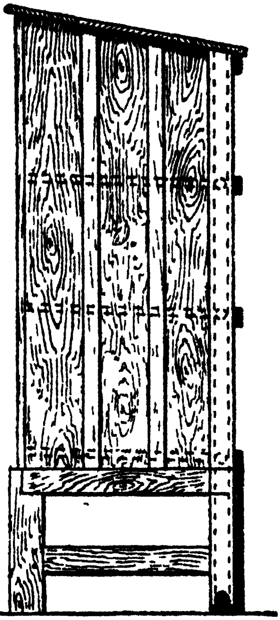


FIG. 128. End Elevation or Side of Hutch showing Down Pipe.

must take care to make them fit very easily, for they are sure to swell a little even under cover—and rabbit hutches ought as a rule to be kept under cover of a shed, lest a driving slanting rain come against the front, and swamp, or render too moist and damp, the interior of the wired compartment—owing to the moisture caused by the rabbit within and the frequent dampness of the air without. All cabinetmaking and most carpentry and joinery may be done with exactness; but in work that is to be regarded as out-door work, anything which serves as a door or a gate should be made easy on account of the influence and action of the weather.

Construction of triple rabbit hutch.

The carcase.

The back.

743. Let us now proceed to the construction of the triple rabbit hutch, which affords room for a buck and two does. When I made my "three-decker" hutch, I made the carcase and front separately, and put in the floors, so to speak, and the partitions, before I put on the front; and the home carpenter will certainly find this to be the easier way. I used 1-inch stuff uniformly throughout; and if the maker can get hold of a piano case or an American organ case, which he can do easily enough and cheaply enough sometimes, he will find in either an abundance of good material which is well suited for his purpose. I need not say much about the main part of the hutch, which I call the carcase. It is merely a box. Each end was composed of three boards 8 inches in width, and the back of seven boards a trifle wider, connected by four battens, 2 inches wide and 1 inch thick, screwed to the boards in the positions shown in Figs. 427 and 428. This rendered the back a firm and solid structure; but before the battens on the outside were put on, temporary slips were screwed to the inside to allow of slips running vertically from top to bottom to be placed over the joints of the boards, as shown in the end elevation side of hutch in Fig. 428, before the battens were put on, as the battens had to be notched in order to fit over them. As soon as this was done the back was nailed to the sides, and the top was put on; temporary battens were then screwed to the front edges of the carcase and to the bottom, until the floors could be put in, and the ends or sides nailed to them. This mode of procedure kept everything fair and square and at the proper distance apart until the floors were put in and the front put on.

The sides and floors of tl compartments.

744. It will be noticed that the floors of the compartments are put in so as to slope slightly from front to back. The fall is comparatively slight, being only to the extent of 1 inch in 24 inches, but this is sufficient for the purpose. Slips or pieces of batten 2 inches by 1 inch—slips 1 inch square would be sufficient—were nailed to the

ends within to furnish ledges on which the floor might rest, and their places were carefully defined and marked in pencil on the inner surface of the sides before the ledges were put on. I used 2-inch ledges myself, because they were more efficient in holding the boards that formed the sides together. Before these ledges were put on in the interior, I kept the boards together by slips which were removed when the ledges were securely screwed into place. When this was accomplished I removed them, and nailed vertical slips, 2 inches wide and ⅜ inch thick, over the joints of the boards, as shown in Fig. 428. Everything was now in readiness for putting in the floors, which were 22¾ inches wide and 56 inches long, and were formed of two 8-inch boards and one 6¾ inches wide. The front edges were put in flush with the front edges of the sides, and the ends were securely skew-nailed to the ledges with 2½-inch wire nails, and the sides were then nailed to the ends of the floors with 2-inch nails. The carcase now began to present a structure of considerable strength and rigidity. The floors were 1¼ inches less in width than the sides, which left an open space of 1¼ inches between the back edge of each floor and the inner surface of the back from side to side.

745. The home carpenter will have surmised long ere this that the slope of the floor and the openings at the back between the back edges of the floors and the inner surface of the back, were to provide means for the drainage; and he was perfectly right in his conjecture. To accomplish this in an efficient manner, I had four sheets of zinc prepared, three of which were 58 inches long, and wide enough to have a trough or gutter made at the back, as shown in section in Fig. 429. These zinc linings, being 58 inches long, allowed 1 inch to be turned up at each end, as shown in Fig. 429 by the dotted lines, and allowance was then made for carrying a piece or prolongation of the zinc through a hole, 1¼ inches in diameter, bored for it through the side shown in Fig. 428 as exhibited in the illustration. The zinc was nailed with the zinc nails used for nailing down this composite metal to the ends of the floor at A, and along the back at B; and when this was done the reader will see that excellent means of drainage were provided on every floor with means for its escape, and that it was also impossible for any moisture to find its way or percolate the floor to be a source of annoyance, and a hindrance to cleanliness, to the occupants of the middle and lower hutches. It was in this way that I sought to render my triple, or "three-decker," rabbit hutch one that might be kept as clean and sweet as any rabbit hutch could be expected to be. The fourth piece of

Linings and drainage of the floors.

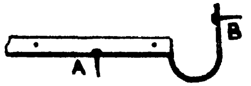


FIG. 429. Section of Part of Zinc Lining to Floor at Back.

zinc that I have spoken of was intended to cover the top, so it was made full 2 inches longer and 2 inches wider, or a trifle more than the top itself, so that it might turn over to the extent of 1 inch all round, and thus completely cover or encase the top and its edges. The zinc casing was nailed to the edges of the top all round, at front, sides, and back.

The divisions between compartments.

Preparation for fixing divisions.

746. The divisions between the compartments of the hutches now claim our consideration, as we will complete the carcase, or body, of the hutch first of all, and leave the front to the last. The home carpenter will have noticed the upright A B in Fig. 426, to which are screwed the buttons that fasten the doors when closed. The edge of this is shown under the same letters in Fig. 427. It is, as I have already said, a piece of batten 2 inches wide and 1 inch thick, and it forms part of the front. I call attention to it now because this will be nailed to the edge of the divisions, and its position in the front must be carefully noted so as to ensure the placing of the divisions with exactness. Now, the width of the small doors and their hanging and falling styles are, when taken together, 19 inches, so we must bear this in mind when making our measurements for placing the divisions. In Fig. 430 I have sought to show a plan in part of the front of the upper compartment, K K representing the zinc-cased floor which stretches from side to side. Following on with the lettering, A represents the side of the hutch in section, and F the division, also in section; C and D represent, in section, the former the hanging style, and the latter the falling style, of the solid door L; D is also the falling style of the wired door, which is just indicated by E. We shall see presently what the parts B, G, H are, of which the first-named is in plan, and the others in section. Now, we know that C + L + D = 19 inches, and we want to manage in such a way that the outer edge of the division F shall butt precisely against the centre of D. By centre I mean, of course, the central line, taken longitudinally along the inner face of D, from top to bottom. Now, F is 1 inch thick, and D is 2 inches wide, and so when D is nailed properly on to the outer edge of F, there will be ½ inch on each side between the sides of F and the edges of D. Therefore, we must measure from the outer face of the side A, along the edge of K, two lengths—one of 17½ inches and the other of 18½ inches. At these distances mark, by aid of square and reamer, two parallel lines, 1 inch apart, on the zinc casing of the floor, and you will have to a nicety the position on which the bottom edge of the division in the topmost part of the hutch will rest. This

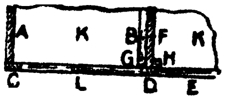


FIG. 430. Part Plan of Front of Closed Compartment of Rabbit Hutch showing Placing of Division.

should be done on the inside face of the top, and the upper surface of each floor, and the lower surface of the two floors that separate the middle hutch from the hutches above and below.

How to make the divisions.

Marking and cutting out partition in topmost hutch.

747. In the first place let me point out that the outer edges of the division or partition between the closed and open parts of each hutch must be flush with the edges of the sides of the carcase, and the floors which separate the hutches one from the other; so each division will be 25 inches in width from front to back. Looking at Fig. 427 the home carpenter will see at once that the top and bottom of each partition must be cut on the level; and to enable us to do this with accuracy, the divisions for the middle and lower hutches must be made about 20 inches in height—not a bit less—*on the square*, that is to say, with the upper and lower edges parallel and equidistant, and the division in the upper hutch must be 23 inches in height. To help the home carpenter as much as possible, I have shown in Fig. 431 how to mark out the partition in the topmost hutch and cast it into shape. Let A B C D, which, like all the preceding figures relating to the triple rabbit hutch, except Fig. 430, is on a scale of $\frac{1}{2}$ inch to 1 foot, represent the partition formed of three boards, namely, two 8 inches and one 9 inches in width; A B C D, therefore, is 23 inches in length or height, and 25 inches wide. First take a point E in A D, a little below A, and having set a bevel accurately to the slope of the roof of the carcase, which may be done by nailing a slip to the edges of the floors, like A B in Fig. 426, till it comes in contact with the inner face of the roof, and then setting the stock of the bevel against the slip, and the blade against the roof. Having done this, apply the stock of the bevel to the edge A D, with the blade against the point E, and make out the line E F. Then test the accuracy of what has just been done by reversing the procedure, and placing the stock of the bevel against the back, and the blade against the roof; next apply the stock of the bevel to B C, placing the blade against the point F, and pass the pencil along the edge of the blade. If the lines thus made coincide throughout, and there is no discrepancy between them, the home carpenter may come to the conclusion that all is right so far. Then along A D and B C measure distances of 20 inches and 17 inches respectively, which will determine the positions of the points G and H. Draw the straight line G H, and then, by the aid of the bevel, test the accuracy of the slope in the same

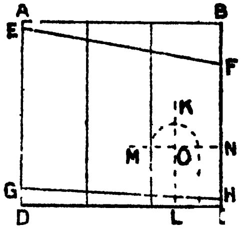


FIG. 431. Diagram showing Mode of cutting out Partitions in Rabbit Hutches.

manner to which we had recourse to draw the straight line E F. The boards that compose the partition should have been fitted together by dowels, and the edges A D and B C trued up with the plane, and parallel to each other: unless the truing up be done we cannot hope for or expect exactness and accuracy in the bevel.

748. We may fix the width of the opening in the partition, that affords communication between the two compartments of the rabbit hutch, at 6 inches, which will leave a piece of board 3 inches in width between the opening and the back of the hutch. At L draw the perpendicular L K, and having measured up 7 inches along the line of junction between the board in which the opening is to be cut and the adjacent board from the line G H, apply the stock of the square to B C and the blade to the point M, thus obtained by measurements, and draw the horizontal line M N. Then from O, the point of intersection of the lines L K and M N, with a radius of 3 inches, describe the dotted arc as shown. The opening thus defined by dotted lines will be 9 inches in height, and its width was fixed, as we know, at 6 inches. To complete the partition we have only to run the tenon saw along the lines E F and G H, and cut out the opening with a compass or key-hole saw. We have only to cut along the dotted vertical line and arc, and the piece thus cut through will easily pull away, or, perhaps, fall away from the adjacent board, as we shall have taken care to put no dowel lower than the place where we judge the crown of the arc will come. The partitions between the compartments in the middle and lower hutches must be marked and cut in the same way shown above for that in the upper hutch.

Communication between compartments

749. With regard to the way in which the partitions are to be fixed, there are more ways than one of doing this. It will be sufficient to nail slips 1 inch square along the lines that have been marked on the roof of the carcase and on the upper face of the topmost floor, at a distance of 17½ inches from the outer face of the left-hand side. The slip on the floor is shown at B in Fig. 430. When this and the slip on the inner face of the roof have been fixed, the partition may be butted against them and either nailed to them or screwed to them. Of course, the partition is put in the larger or open compartment of the hutch, and the nailing or screwing is done from that side. The position of the inner edge is carefully determined on the outer face of the back, which is then nailed securely to it. If the zinc casing has not yet been put on the top, a few nails may be driven through it into the upper edge of the partition to keep it firmly fixed in its place. Another plan is to nail down another slip parallel to

Fixing partitions.

Alternative plan.

B along the 18½-inch line, and to do the same on the inside surface of the top; the partition may then be pushed in, as the parallel slips at the top and bottom will be as grooves into which it is put. The slip or slips should be cut away at the opening or entrance, so that the surface of the floor may have nothing on it that will offer any obstruction to ingress or egress from one compartment of the hutch to the other.

750. It will be noticed by the home carpenter that the whole structure is placed on a stand or stool, about which a few words may well be said. Four pieces are first selected as legs, 18 inches in height and 4 inches square. Into this a rail, 60 inches long and 4 inches wide and 3 inches deep, is halved, and struts, 3 inches wide and 3 inches thick, or even 2 inches thick, are mortised into legs and rail. A similar piece of framing is made for the back of the stand, and front and back piece are then connected by rails - the upper rail halved in and the lower one mortised in. The mode of construction is fairly self-evident from the drawings in Figs. 426, 427, and 428; but, lest my meaning should not be perfectly clear, I give in Fig. 432 a diagram showing how the front and side rails are connected with the top of the leg. In Fig. 432 E represents the only part of the top of the leg that is visible when the connection is complete. This is shown as if it were in section; the whole diagram, however, is in plan. The front rail is represented by A, and the side rail by B. Pieces 1½ inches in width are first cut away on the outer faces of the leg, as shown, to the depth of 3 inches. This leaves E in the form of a square 2½ inches each way. In order, however, to give additional bearing to the rails—for the hutch is very heavy—slight bearings 3 inches long and ½ inch wide are cut at C and D, and the rails themselves are so cut that the ends enter and rest on the top of the leg, as shown; the whole width of the rail resting on a shoulder ½ inch in width, cut on the inner faces of the leg. The same plan is carried out on each leg for effecting connection between leg and rails. The shoulders must be taken out of E with mallet and chisel. This, I think, is all that I need say about the stand or stool. As soon as the stand is made the carcase may be placed on it in readiness to receive the front. It will be noticed that the stand projects beyond the hutch at front, back, and sides, by 1 inch, and before placing the hutch on the stand it will be better to show by pencil lines just where the hutch will come, so that it may be properly adjusted.

Stand or stool for hutch.

Connection between rails and leg at top.

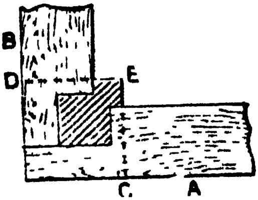


FIG. 432. Diagram showing connection of Rails with Leg of Stool.

751. The next thing to be thought of is the down pipe to carry off the drainage from the hutches, which down pipe is shown to the right in Fig. 428. As the stand projects beyond the hutch, the best way will be to screw a slip of wood 1¾ inches in width and 1 inch thick, along the face of the side in the position shown, just ⅝ inch from the outer edge of the back, boring holes in it of sufficient size to allow of the escape of the drainage. Fig. 433 will afford some idea of its construction, but it should be said that both Figs. 432 and 433, although drawn in due proportion, are not drawn to any scale. In this A represents the piece of wood, 1 inch thick and 1¾ inches wide, that is screwed to the side of the hutch, and A E represents a piece of zinc with which the bottom of each orifice is partly bushed. This piece of zinc is carried to a small extent outwards and inwards, so that the inner piece, from the floor of the cage, may rest upon it, as shown in Fig. 434. To continue, however, with Fig. 433, when the piece of wood, 1¾ inches wide and 1 inch thick, shown between A and E, has been screwed to the side, two pieces or cheeks, B and C, are nailed or screwed to the edges of A E. These pieces are ⅝ inch thick, so that the external width of the down pipe is 3 inches. The width of B and C is 3⅝ inches on 2¾ inches. To the edges of these the piece D, 3 inches wide and ⅝ inch thick, is *screwed*, so that it may be easily removed to rectify any stoppage within that hinders the proper escape of the drainage. In Fig. 434, a vertical section of the down pipe is shown, with section of the side to which it is attached. Externally, the down pipe is 3 inches square. Internally, the size of the part left white in Fig. 433, and lettered E, as I may say, is 1¾ inches by 1⅜ inches, and this is sufficient for the purpose for which it is intended. The mode of escape from the down pipe for the drainage received into it from the floors of the three hutches is shown at the foot of the down pipe in Fig. 428.

Construction of down pipe.

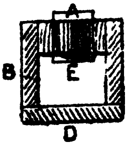


FIG. 433. Section of Down Pipe.

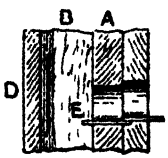


FIG. 434. Vertical Section of part of Drain Pipe.

752. At last we come to the front itself, and as its dimensions have been given already in a previous section there will be no necessity to repeat them now. With regard to construction, three standards are first cut, namely, C D, A B, and E F, and these are halved into five rails G H, K L, M N, O P, and Q R. Thus we have a piece of framing with eight openings in it. Of these openings six are filled, three by the smaller doors to the left and three by the larger doors to the left. The small doors, 15 inches wide and 14 inches high, and made of two boards 7½ inches wide, dowelled together

Construction of front: small doors.

and strengthened by transverse ledges within. They are attached to the outer surface of the standard which forms the hanging style for the three, namely, C D, by T hinges, otherwise known as cross-garnets, and are secured by buttons screwed on to the standard A B, which serves as the falling style. When closed the small doors fall to and are stopped from further ingress by the vertical slips, 1 inch square, that are shown in section at G and H, in Fig. 430. These are screwed to the partition—one on each side. The wired doors are formed of frames: these frames are made of battens 2 inches wide and 1 inch thick, and are—taking their external measurement—37 inches in length, and 14 inches in height. Wire is then strained over the *inside* of the doors to the outer edges of the frame, and this prevents the rabbits from gnawing and nibbling at the wood in the inside. These doors are attached to their common hanging style by butt hinges, and secured by buttons screwed to the falling style A B. The doors are furnished with knobs which serve as handles, and by which they can be pulled open if they get a little swollen by moisture, and get tight, or hang in any way.

Wired doors.

753. There is but one thing more, I think, that requires explanation with regard to the triple rabbit hutch, and that is—why the upper surface of the floor, or rather the edge of the upper surface, coincides with the lower edge of the upper rail in the wired doors. This arrangement, which is done with a purpose, affords greater facilities for cleaning out the hutches than would have been found if the floors had been placed higher up. It is shown in Fig. 426, in which the position of the floors is indicated in the pieces S, T, and U, projecting on the left of the illustration and continued across it from left to right by dotted lines on the solid doors of the smaller compartments, and by a line below the upper rail of each wired door. To make this perfectly clear to the home carpenter, I have given in Fig. 435 an illustration which exhibits the interior of the hutches when the doors are all open. I have, however, left a portion of the doors of the compartments attached to the hanging styles, so that any misconception of what is meant may be avoided. I have lettered the different parts in accordance with the lettering in Fig. 426 to ensure recognition of that part of the hutch in Fig. 426 that is repeated in Fig. 435. Had the floors been placed higher,

Reasons for position of floors.

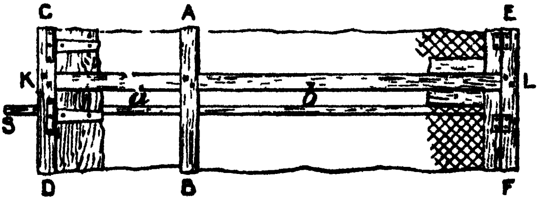


FIG. 435. Diagram showing position of Floors in Triple Hutch.

they must have been placed in the same plane with the upper edge of K L, or with the lower edge of the floor coincident with the upper edge of this rail, and there would have arisen a temptation to clean out the topmost and middle tiers without opening the doors below them ; and this would have led to all sorts of evils in the shape of collection of dirt that would fall on the top of the door below, and worst of all, on the top of the standard adjacent to the hanging style, which would have led to jamming and an undue strain on the hinges. This is avoided by placing the floors as I have shown ; and when cleaning the hutches, the doors of the topmost and middle should first be opened for the cleansing of the topmost compartment, and then the middle and lower doors should be opened for the cleansing of the middle compartment. Thus, the doors being thrown open, the accumulations in the upper compartment are swept out through the openings *a* and *b*, below K L, in Fig. 435, and I may say that the rail K L in no way interferes with the removal of the litter as might be thought. The litter may be caught in a dust pan or dust box, instead of being swept on to the ground and gathered up from thence. When it is removed from the lowest compartment, the doors of that compartment only will be opened ; but the pieces of wood marked V and W, in Fig. 426, must be removed, as they cover in a space below the rail O P, similar to that shown at *a* and *b* in Fig. 435. The reader now knows as much as I can possibly tell him about my triple, three-fold, or "three-decker" rabbit hutch.

754. The rabbit trough is a pig's trough in miniature. I have shown one in front elevation, end elevation, and section in Fig. 436. First, for the body of the trough, get out two pieces of 1 inch stuff, 15 inches long, and let one be 4½ inches wide and the other 3½ inches wide. Nail the edge of the wider board to the edge of the narrower board, as shown in the section C, and having done this, reduce the edges at top, making them flat as in section. These pieces of board are at right angles to each other, and it will be noted that the inner surface at the lower edge of the wider board is applied to the edge of the narrower board. The depth of the trough thus made, measuring vertically from the angle formed by the junction of the boards, is about 2 inches, perhaps a trifle more. For the ends take two pieces of wood 7 inches long, 4 inches wide, and 1 inch thick, and groove them to the depth of ½ inch, forming the sides of the grooves

Rabbit trough.

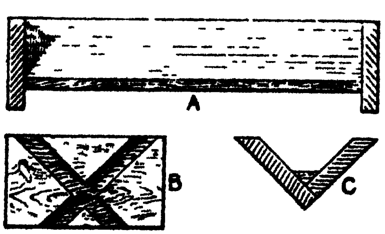


FIG. 436. Rabbit Trough. A. Side Elevation. B. End Elevation. C. Section.

with saw cuts made by a tenon saw. Clear away the stuff between the cuts, as far as you can, with sureness that you are not exceeding the depth, and finish up by cleaning with a router set to the depth of ¼ inch. Then fit these ends on to the ends of the body of the trough previously made, and nail them firmly to the body. You then have your trough made sufficiently complete for all practical purposes, and most home carpenters would leave it so; but I go a step further. Take a piece of wood 1 inch square, and having sawn it in half longitudinally and diagonally, like a small arris rail, fit one half into the bottom of the trough, as shown in c. It prevents the food from settling in the bottom of the V-shaped trough, and renders it easier for the rabbit to clear it up, and the trough itself is easier to clean. Nail a strip of zinc along this, and strips of the same material along the edges of the body of the trough and the sides as well. I prefer, myself, to line the whole of the inside of the trough, as well as the edges at the top, with zinc, which is easily cut with tinman's shears, or even with a pair of strong common scissors. It must then be nailed in place with the smallest zinc nails that can be procured. If iron or wire tacks are used, galvanic action is at once set up, and the zinc soon perishes. Zinc-lined troughs are more easily kept clean than wooden ones, and the zinc on the edges prevents the rabbit from gnawing the wood.

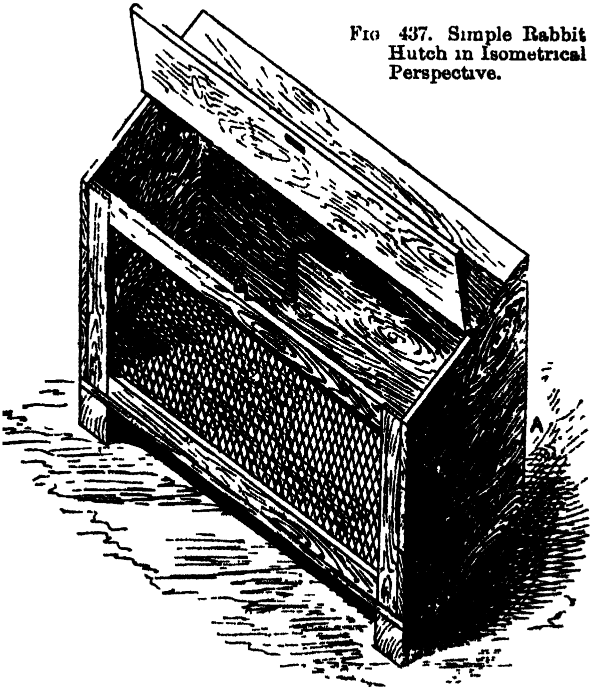


FIG 437. Simple Rabbit Hutch in Isometrical Perspective.

Simple or subsidiary rabbit hutches.

755. The hutch shown in Fig. 437 is very easily and quickly made. It may be extemporised at any time out of a box of sufficient size, strongly made, by putting a wired front into the top, and then, turning it on one side, take off half the opposite side, and make it to

open as shown in the illustration. As there will be nothing above or below hutches of this sort, it will be enough to bore holes in the bottom for drainage, and the lowest board at one end, as shown, or a part of it, may be made to open and shut, so as to sweep out all the litter with ease when the hutch is cleaned. Hutches of any size may be made like this,—smaller ones for fattening rabbits, and larger ones for keeping rabbits in them. A range of fattening hutches may easily be made to take three or four in a row.

756. If, however, the home carpenter determines to make one of these, he will find a length of 4 feet and width and height of $2\frac{1}{2}$ feet convenient for his purpose. These are the dimensions of the hutch shown in Fig. 437, roughly speaking, for there is no occasion to be precise here about measurements, as in the case of the composite triple rabbit hutch. First, then, make a wire front of these dimensions, and a back of the same size, using battens 2 inches by 1 inch for the frame of the front, and 1 inch stuff for the back. Nail the sides, as shown to front and back, and provide for an opening at one end to open and close at pleasure as at A, or make the front a little narrower, or the height of the box more, say 2 inches, so as to leave a space under the front for sweeping out the remainder of the litter after the bulk has been lifted out at the top. Nail on boards to the front, back, and sides, to form the bottom, but instead of setting them closely together, so that the edge of one touches the edge of the other throughout their length and boring holes in them for drainage, leave a space between them of $\frac{1}{4}$-inch and $\frac{3}{8}$-inch, to make provision for this and for ventilation as well. With regard to the top or lid of the hutch, make this in two equal points, as shown in the illustration. Nail on the hinder portion and attach the front part to it with butt hinges or small T hinges put on outside. It will be as well to let the front part of the lid project about 1 inch beyond the front of the box, as it will then be better for cutting a slot in it, as shown to fit down over the staple projecting from the top. The hutch can then be fastened up by putting a peg through the projecting loop of the staple, or by putting on a padlock, as the home carpenter may choose. The board at A must be treated in the same way as regards fastening. Nail two clumps of wood, 2 inches by 1 inch, and about 6 inches in height, to the front and back so that A may butt against a width of 2 inches instead of 1 inch. Fix staples in these clumps and cut slots in A, through which they may pass. Fasten the board down with pegs thrust through the loops of the staples. To prevent loss or mislaying of the pegs, cut a notch round the thick end and tie a piece of string or binding wire round it and nail

Mode of making simple rabbit hutch.

the free end of the string to the board in each case. This will often save a deal of trouble.

757. There is only one point yet to be touched on with regard to the easily and quickly made rabbit hutch that I have been describing, and that is, provision for a stand of some kind to raise it from the ground. I have shown it in Fig. 437, as raised on a couple of clumps of wood about 3 inches square. I would prefer myself to raise it on trestles about 18 inches in height—either clumps or trestles would do—and the trestles might be lightly made, one for each end, and connected by transverse rails nailed to the outer or inner faces of the legs as the home carpenter may prefer. When a hutch of this kind stands by itself the opening through which the refuse is to be swept or drawn may be either in front or at the sides as shown in Fig. 437. When a number of rabbit hutches, whether as hutches wherein to keep rabbits, or as hutches in which to fatten them, are placed in a row, end to end, the number ranging from three upwards, they must be placed on a long stand 18 inches high, made expressly for their reception. In this case, if there be two hutches, the openings may be at the side—one hutch having it on the right side and the other on the left—but if there be three or more in a row, the opening for removal of refuse *must* of necessity be in front. Hutches strictly made as shown in Fig. 437 should be used for young rabbits, and lest they should find their way out, as they will through the opening, the mesh of the wire netting used for the front should be very small.

Stand for simple rabbit hutch.

758. I will now content myself, and, I trust, my readers, too, by describing and illustrating a convenient hutch which I once saw for young rabbits from the time they were taken from the doe till they were removed to other hutches for fattening or for keeping apart for breeding purposes. The great point about it is its size, for it affords room enough for young rabbits to run about and thus get exercise. The hutch that I saw and which I have sketched in Fig. 438 took the form of a comparatively shallow box, that is to say, shallow in comparison with its length and breadth. The wired front is a fixture—not a tenant's fixture, but a fixture belonging to hutch and owner. There are two doors in the upper part for the introduction of food, cleansing, etc., and there is a swing door in the end to the right, which admits of the easy removal of all litter and refuse from the floor of the hutch, and slips are nailed to the doors at top, lapping over the parts of the roof adjacent to them to the extent of one-half the width of the slip to prevent the entrance of rain. It will be better to cover over the doors and parts of the roof adjacent with zinc, Willesden paper or felt—preferably

Large hutch for young rabbits.

zinc or Willesden paper—before putting on the slips The boards forming the front, back, or sides are 8 inches in width. The hutch itself, which is drawn to a scale of $\frac{3}{8}$ inch to 1 foot, is 8 feet long, 3 feet wide, and 3 feet 6 inches measuring up to the eaves formed by the overhanging lid or roof, and at the highest part it is 4 feet high. These measurements are taken from the ground upwards, and the legs, which are 18 inches long externally, are included.

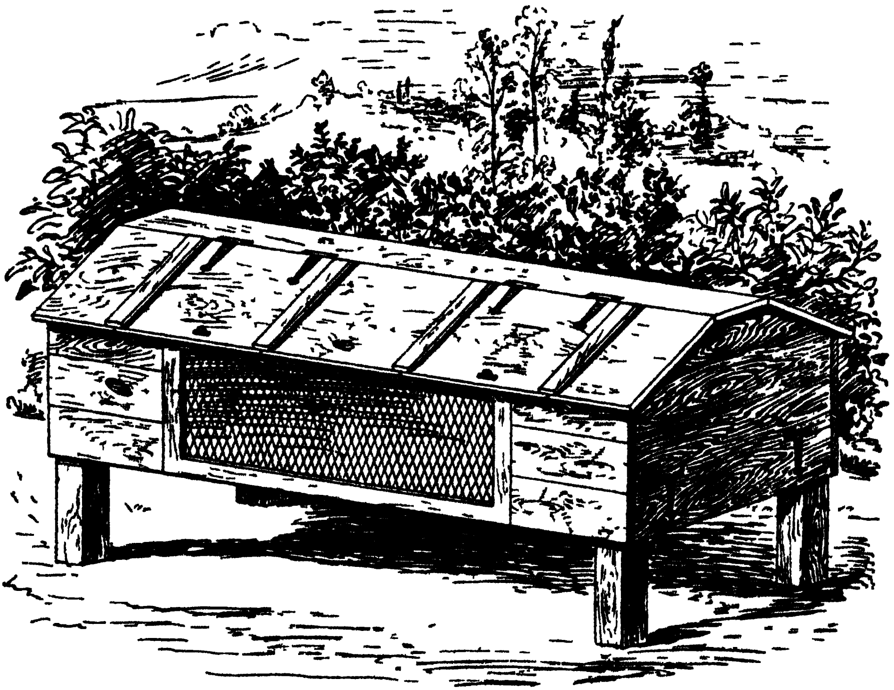


FIG. 438. Sketch View of Large Hutch for Young Rabbits.

Form of the legs of the hutch

759. The box being long and extremely heavy it is a matter of necessity that the legs should be strong, and, for strength's sake, they are made of stuff 4 inches square. They run up *inside* the hutch until they meet the roof, and a framing is then notched into them to carry the ends of the roof, for both front, back, sides and roof are nailed down hard and fast to the upper part of the legs and the framing just mentioned Fig. 439 will show how the legs are cut within the hutch, for, from the floor upwards, the corner or angle in front is removed, and the leg at top nearly assumes the form of an arris rail set vertically. Indeed, there is no reason why the entire leg from top to bottom should not be made of a piece of arris rail. The front,

back and sides are then nailed to the outer faces, A and B, of the legs. Slips 1 inch square are screwed to the bottom of the lowest board of front, back and sides, except on the right side or end where it is notched into the legs, so that it may be independent of the door at the side, and that this door may fall against it and the floor itself which is dropped in on the slips and nailed to the slips, the boards at front, back, and end to the left being also nailed to the edge of the boards that form the floor. Between the floor boards leave a space, from $\frac{1}{4}$ inch to $\frac{3}{8}$ inch in width, to provide for drainage. If the home carpenter wishes to do so, he may use feather-edged boards in making a hutch of this kind, but I prefer myself boards of uniform thickness of 1 inch throughout, nailed to the outer faces of the legs in the manner shown. The exterior of the hutch should be well painted or tarred; but if tarring is resorted to, use Stockholm tar, and not coal tar, which is only fit for fences. The mode of hanging the doors with T hinges, and fastening them with staples and pegs, will be clearly understood from all that has been already said in previous sections on these points.

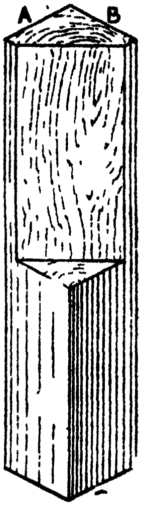


FIG. 439. Formation of Leg.

760. Let us now pass on to the mode to be followed in keeping rabbits in semi-restraint, which is a much more natural and reasonable way of keeping them, and far more pleasant and comfortable for the rabbit than under complete restriction in boxes. First of all a pit is sunk in the ground—excavated is the proper term and if made 8 feet in diameter it will be large enough for all practical purposes. A light porous soil, either sandy in character as found near and about Aldershot, or a good loam easily worked, is the best suited for the purpose. The pit may be circular, hexagonal or octagonal in form, but of the three I prefer the octagonal form, because the circular shape is all the more difficult to fence round, and almost involves recourse to wire netting: whereas the hexagonal and octagonal forms can be easily surrounded with a fencing of rods placed vertically, say mopsticks, as recommended in an earlier part of this volume, for railings, or even trellis. I have said that I like the octagonal form best, and for this reason, that the roof is upborne by eight posts instead of six, which gives more strength to the structure. I will explain the construction of the pit, and the purposes to which it is turned, presently; but just now I will confine myself to the shelter shown in Fig. 440, and finish this off before going any further.

Rabbits under semi-restraint.

Rabbit pit: its formation.

761. Let us suppose the pit to be octagonal in form, and that it measures 8 feet from side to side. Then the first thing to be done will be to stake out the ground and remove the soil to a depth ranging from 3 to 4 feet, but preferably 4 feet. The pit itself when finished will be 8 feet in diameter, but parallel lines to the eight sides of the pit must be drawn at a distance of from 12 to 18 inches from them, and diagonals taken across from corner to corner of the pit and extending to the parallel lines, so as to determine the position of the posts that are destined to sustain the roof. This will be better comprehended by the aid of Fig. 441, in which the inner solid lines define the margin of the pit, and the outer dotted lines, parallel to the inner lines, the position of the posts or uprights of the shelter, which are placed in holes dug for their reception at the intersection of the outer dotted lines with the diagonals of the octagon. The perpendicularity of the posts, which should be of larch or fir, must be tested by the plumb level. Strong gravel boards should be placed on the ground between adjacent posts all round, and rails about 4 feet from the ground from post to post in *seven* of the spaces, but the eighth must be left without a rail for the placing of a gate above the gravel board. The spaces between rails and gravel boards, or rather copings of larch or fir nailed to the upper edge of the gravel boards, should be filled with mopstick railing, trellis work or strong wire netting;

Construction of shelter over rabbit pit.

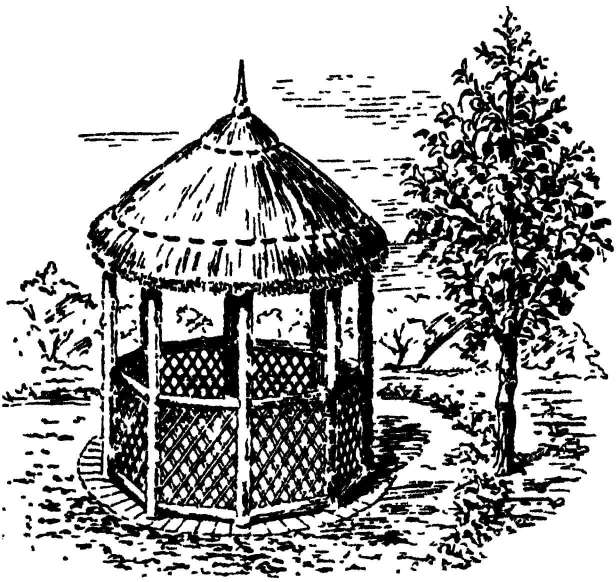


FIG. 440. Sketch View of Shelter over Rabbit Pit with Pyramid Fruit Tree

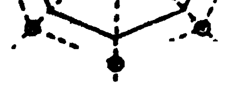


FIG. 441. Determination of Position of Posts for Shelter.

but whatever is used must be small enough in one case and close enough in the other to prevent the entrance of dog or fox; and it will be as well to put spikes along the top of the rails, to prevent loafers from lounging on them when seeking to inspect the interior, and to furnish a job for the tailor at all events, if not for the chemist or doctor, in case any one attempted to climb over. The gate must be strongly made, and of material that will match the railing round the pit. One post will form the hanging style, the gate being furnished with strong hinges with sockets to fit on to staples driven into the post. A piece of wood must be nailed vertically to the falling post, against which the gate may fall. The gate should be fastened by a hasp dropped into an eye, formed by a staple driven into the falling post, and a padlock passed through the eye or ring at the end of the hasp.

Construction of roof of shelter.

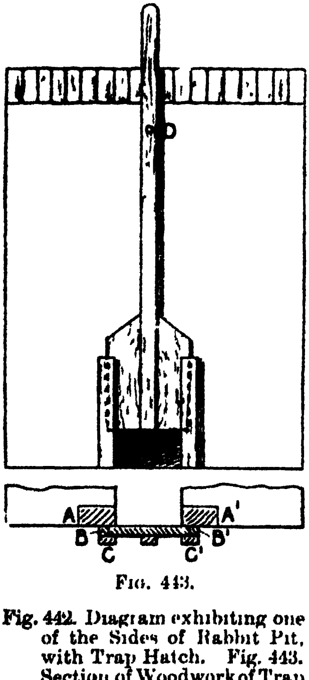
762. A strong wallplate must be attached all round to the tops of the posts, which should be about from 7 to 8 feet high, although 6 feet 6 inches might be deemed sufficient. The lower ends of the rafters must be notched on to and into the wallplates at their junction on the top of each post, and the upper ends should be butted against and nailed to an octagonal clump of wood forming the centre of the roof. Transverse bars should then be nailed to the rafters, about 12 inches apart, and the roof should then be covered in by thatching as shown. The home carpenter may make a wooden roof if he likes, but a thatched roof certainly has the merit of presenting a more picturesque appearance. Moreover, the eaves of the thatched roof will project to a greater distance than those of a wooden roof, and throw the drip well beyond the posts and the brink of the pit: and it will afford shelter against driving rain.

Containing walls of pits.

763. With regard to the pit itself, let us suppose that the excavation has been made and carried to the width of 9 feet from side to side, so that there may be room for a containing wall, which leaves the pit exactly 8 feet from side to side when this has been put up. Now, the question is: Of what shall the containing wall be made? It may be of concrete, or of brick, or even of thick slabs of wood, or larches, or firs sawn in half longitudinally. I prefer, however, to make it of brick or concrete myself, finishing at the top with a coping of the same between the edge of the pit and the surrounding gravel boards; but however this may be, the containing wall on each side of the pit must be made with an opening, subject to closure at pleasure, with a trap hatch. The opening, when the framing is made, need not be more than 8 inches in width and 10 inches high. The object of these holes is that the rabbits may burrow into the soil and breed in the

natural way. They will be perfectly safe in the holes, for rabbits have a tendency to burrow downwards rather than upwards. The bottom of each opening should be about 4 inches above the floor of the pit.

FIG. 442.



Trap hatch in side of pit.

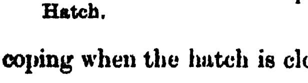


FIG. 443.

Fig. 442. Diagram exhibiting one of the Sides of Rabbit Pit, with Trap Hatch. **Fig. 443.** Section of Woodwork of Trap Hatch.

764. Now, instead of attempting to give a section of the pit vertically showing arrangement on three or four sides, I will represent, on a scale of ½ inch to the foot, just one side of the pit with the trap hatch in Fig. 442, and a section of the trap hatch in Fig. 443. If the pit be 8 feet wide from corner to corner, or from side to side, the length of each side will be just on 3 feet; so the side represented in Fig. 442 is 3 feet in width and 4 feet in height. I have supposed the containing wall to be of concrete, but I have put a coping of brick, as if made of hard blue Staffordshire bricks it will perhaps be more durable and less susceptible of injury than one faced with cement, as the concrete wall will be. The opening in the concrete wall for the entrance and exit of the rabbits we took to be 10 inches high and 8 inches wide, and in two places, on each side of the opening, wood bricks should be built into the concrete, to which the frame of the trap hatch may be fastened. In Fig. 443 A, A′ represents these wood bricks, and B, B′ cleats nailed to them at a distance apart of 10 inches full. These cleats may be wider than shown, if the home carpenter pleases. On to these two slips C, C′ are nailed, the inner edges of which are 8 inches apart. These, when thus put together, form two L-shaped grooves in which the trap hatch moves up and down, actuated by a long handle that is about 4 inches above the coping when the hatch is closed. The hatch itself is 10 inches wide, 14 inches high, measuring from the bottom to the highest point, and 1½ inches thick. It should be made to work very easily in the grooves, in case it should get swollen with moisture and stick fast. It is prevented from going below the bottom of the hole by stops put into the grooves, and when pulled up nearly to the top of the grooves it is held in place by an iron peg passed through the hole D, which catches on to the coping. The hatch is kept up, and the hole left open at all times, except when it is desired to catch and kill any rabbits

for market or for eating at home. The hatches are then let down when the rabbits are feeding, and the rabbits are then easy to catch. When any catching is going on, the catcher should bring a short five-foot ladder with him to facilitate his descent into the pit, and his exit therefrom with his prey. The ladder should not be kept in the pit or near it, lest visitors of questionable character and sinister design should use it.

765. There is one thing that I must not forget, and that is the drainage of the floor of the pit, which should be of concrete faced with cement. The floor should slope slightly, say 1 inch in 1 foot, from the sides of the pit all round towards the centre, in which a small cesspit, from 12 to 18 inches in width and from 2 feet to 2 feet 6 inches in depth, should be formed, and covered with an iron grating. Rain will drive in, and with the liquid and excreta voided by the rabbit will form a valuable liquid manure, which should be withdrawn from the pit from time to time by a small suction pump, or even a large syringe. The fluid should not be allowed to remain in the cesspit too long, as the exhalations from it will be strong and unpleasant. The food that the rabbits eat, that is to say, the green food, will be thrown on the floor of the pit; other food, such as bran, brewers' grains, etc., should be put in troughs provided for the purpose; and the pit should frequently be cleared of all refuse, stale food, and droppings. The reader will have noticed that a pyramid fruit tree is placed in close vicinity to the pit in Fig. 440. It is in reality too close; but my reason for putting in the tree in the illustration is to call attention to the fact that if rabbit breeding and feeding in this way were carried out on a large scale, and many pits were disposed in lines, say from 20 to 24 feet apart, rows of pyramid trees might be put between them, and when set in good mould put in place of any too sandy soil, when they are planted in pits dug for the purpose, might be kept in good heart by manure gathered from the pits, which, with the refuse, would serve as excellent mulching. There would, however, be far more manure gathered from the pits than would be wanted for this purpose.

Cesspit for catching drainage.

Fruit trees near pits.

766. Possibly it may be that some amateur woodworkers who are keeping, or about to keep, rabbits may find the information that I am now going to give them, both useful and acceptable. They may, perhaps, be in need of additional hutches, and may not have time to make them throughout—front and all – and in this case the Jersey Company, Limited, comes to the rescue with the ready-made fronts for rabbit hutches that the company manufacture and supply. The nature of these is shown in Fig. 444, from which it appears that the front is a frame in which the door that gives

Ready-made fronts for rabbit hutches.

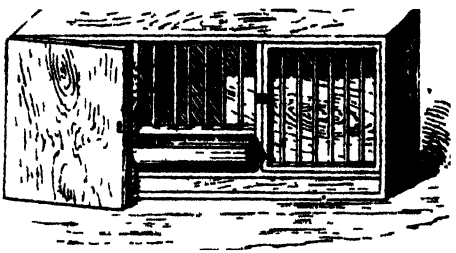


FIG. 444. Front for Rabbit Hutch.

access to the sleeping place is on the left. Another barred door, through which rabbits may be introduced or withdrawn, and green food placed in the hutch, is on the right; and in the centre, between the doors, there is a space barred at top to correspond with the door on the right, with a feeding trough, which may be shifted at pleasure from outside to inside, and *vice versâ*, for bran, brewers' grains, etc.; and under the feeding trough and door on the right is a space that may be opened and closed up at will, and which is both serviceable and useful, as it may be moved when necessary for cleaning out the cage without opening the door. If, then, the woodworker makes a rabbit hutch of wood, 3 feet or 3 feet 6 inches in length, 1 foot 6 inches in height, and 1 foot 6 inches or 2 feet deep, with a partition to divide the hutch into two compartments, he has nothing more to do than to get one of these fronts and screw it on. The fronts are made in two sizes, 3 feet long by 1 foot 6 inches high, or 3 feet 6 inches long and 1 foot 6 inches high; hence the dimensions given above for the wooden part of the hutches. Wood hutches with compartments are also made and supplied by the company, but the home carpenter will doubtless prefer to do this part of the work himself. One of the chief advantages in these fronts is the shifting trough in the central part. It does away with any necessity for a wooden trough in the cage or hutch, which, in the case of full-grown rabbits which are kept separately for breeding purposes, is frequently shifted by them and even overturned.

Wood hutches with compartments.

CHAPTER IV.

THE DOG. ITS KENNELS, AND HOW THEY MAY BE MADE

Ordinary Dog Kennel: Dimensions—Construction of Kennel: the Sides—The Floor of Kennel—Back and Front—Connection of Parts—The Roof—How to finish Kennel—Composite Kennel for Three Dogs—General Dimensions of Triple Kennel—Framing on which to construct Kennel—Provisions for Mortises to receive Uprights—Definition of Position of Uprights in Front—Provision for Wallplates to Kennel—Completion of Framing: Entrances—Paving for Floor of Kennel—Putting up the Partitions between Compartments—Covering in with Weather Boarding—Kennel for Litter of Puppies and Mother—Construction of Kennel—Construction of Fore Part and Back Part—Construction of the Fore Part of Kennel—The Roof—Ornamental Tub Kennel—Supposed Dimensions of Tub for Kennel—Stand for Tub Kennel—Completion of Stand for Tub—Formation of Framing round Tub Kennel—Provision for Roofing over Tub Kennel—Barge-boards and Brackets—Cresting at Ends of Roof and Boards of Roof—Ornamentation of Entrance—Kennels in Corners—Platforms in Front of Kennels—Travelling Boxes for Dogs.

Ordinary dog kennel. dimensions.

767. I HAVE shown in Fig. 445 a dog kennel of the ordinary type, and of the kind perhaps nine out of every ten home carpenters would wish to make. It is a compact and solid structure, utterly devoid of ornament, and it is very heavy, so that it is difficult for a man, much less a dog, to move it from its place. It is drawn to a scale of ½ inch to 1 foot, and is therefore 2 feet in length, 18 inches in width, and from 29 to 30 inches in height, measuring from the under surface of the floor to the capping. The sides, however, are 20 inches in height. The entrance is 9 inches in width and 18 inches in height. A kennel of the size shown in Fig. 445 is suitable for a dog of some size, say a collie, a pointer, or even a setter, although the last-named kind of dog might feel somewhat cramped in it. It will be noted that, according to proportion, the front is 3 parts wide, the sides 4 parts long, and

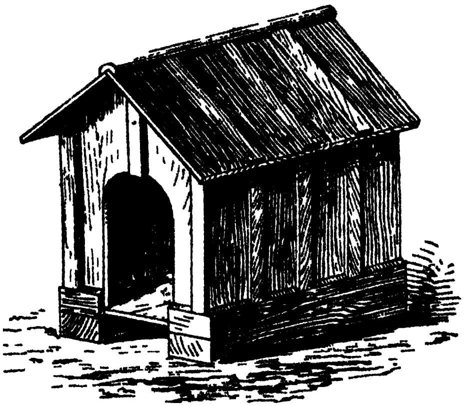


FIG. 445. Ordinary Dog Kennel

the height is equivalent to 5 parts; and in building dog kennels of any size, whether large or small. this proportion may be preserved. The kennel should in every case be suited to the size of the dog, and should be large enough to admit of the animal turning itself with ease in it, and to be, when lying down, just about full length. A staple should be fixed in the front where shown. The dimensions given have been, so far, dimensions of the structure as a whole: but dimensions of details will be given when describing the construction of the kennel, which I will proceed to do in the next section.

Construction of kennel. the sides.

768. Make, first of all, two pieces of framing of battens, 2 inches wide and 1 inch thick, with a central rail, and let the framing be 1 foot 10 inches, or 22 inches, long and 19 inches high. To these framings screw vertical boards, say four boards, 6 inches wide, so that the end boards will lap over the frames by 1 inch; let the boards lap to the extent of 1 inch over the bottom edge of the lowest rail, but let the top of the boards come just 1 inch below the topmost edge of the upper rail, which the home carpenter had better make 3 inches in width instead of 2 inches as said, so that the framing will be 22 inches long and 20 inches high, instead of 19 inches as first stated. This is shown in Fig. 446, which I have purposely drawn on a large scale, namely, 1½ inches to 1 foot, for clearness' sake. In this, A, B and C represent the rails in section, and D shows end view of inside edge of upright, E is a board screwed on to the framing. In this the height of D is shown to be 20 inches, and the height of the board is 20 inches also; but it is put on in such a way as to fall short of the upper edge of A by 1 inch, and to overlap the lower edge of C by 1 inch. The attachment of the side to the floor is shown at F, F being the floor, which is also 1 inch in thickness, as all the material that is used should be. The top of rail A and board E is taken off at an angle of 45°, as shown by the diagonal line G H. This affords a secure lodgment for the roof, the lower part of which is butted and securely nailed to G and E, when thus cut. When the sides have been put together, lay them apart and proceed with other parts of the structure.

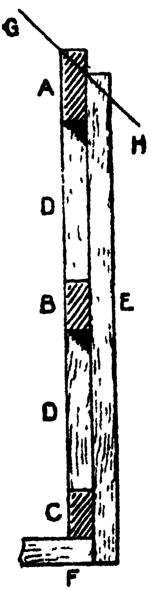


Fig. 446. Construction of Side of Kennel.

769. And first with the floor, which make 23 inches in length and 16 inches wide, cutting the front as shown at F. Thus, F being 9 inches in width, the front is recessed on each side of the central projection F, to the extent of 3½ inches in length and 1 inch in depth. When the sides and floor

are put together, the lower rails, C C, of the framing will drop on to the floor, and the sides E E will be nailed to its edges. But before doing this it will be necessary to make the back and provide for the front of the kennel. Make the back in much the same way as the sides were made; but instead of making a frame for it, it will be sufficient to connect the boards that form the back with transverse pieces of batten. Make the back 16 inches in width and 28 inches in height, taking care to make the battens 14 inches long, so that the back may lap over them by 1 inch on each side. Now make the front out of two 8-inch boards, having used the same kind for the back, and dowel them together. This is all that will be needful. Let the front also be 28 inches in height. Cut out the entrance, making it 9 inches wide and 12 inches high— up to the spring of the arch —which must be struck out with a radius of $4\frac{1}{2}$ inches from the central point of a horizontal line drawn across the boards that form the front at a height of 12 inches. The floor, sides, front and back may now be taken up and nailed together; but before doing this the top of each side must be bevelled at an angle of 45°, as shown at G H in Fig. 446. This done, the top of the back and the top of the front must be cut to the central point at an angle of 45°, so that the upper part of each is a right angle. Lastly, nail battens to the *inside* of front and back, about 3 inches below the apex of each, and on these lodge a piece of arris rail whose sides correspond with the diagonal slope of the front and back, and nail these securely to the ends of the arris rail, which will form a substantial ridge piece to which to nail the top of the boards that form the roof.

The floor of kennel.

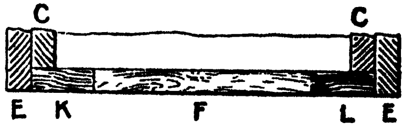


FIG. 447 Mode of Cutting Front Edge of Floor.

Back and front.

Connection of parts.

770. The body at main part of the kennel is now ready for the roof, which should overhang front, back, and sides all round to the extent of 3 inches. Thus, as the kennel is 2 feet in length the sides of the roof will be 30 inches long and 18 inches wide. Put them together at the top in such a way that the ends of the boards on one side lap over the edges of the boards on the other. Screw the boards down, or nail them, as you please, securely to the ridge piece and the bevelled top of each side, and the kennel is practically complete; but a little yet remains to be done to it. This consists, first of all, in nailing slips, 2 inches wide and $\frac{3}{8}$ inch thick, over the junction of the vertically placed boards of the roof, and then putting a capping over the ridge, just notching the capping sufficiently to allow the slips to enter it for about $\frac{3}{8}$ inch. Then nail vertical slips over the junction of the boards that

The roof.

form the sides and the junction of sides with front and back and in centre of front and back; but, before doing this, nail boards 3 inches wide, 1 inch thick, and of the requisite length, round the bottom of the kennel to form a plinth, and then let the ends of the slips be cut in such a way as to butt on to and against the top of the plinth, which must be bevelled as shown in Fig 445. It will now be desirable to place the kennel on two pieces of wood, 26 inches long, 4 inches wide, and 3 inches deep, and; this done, to give it three good coats of paint to keep it from the weather, as it will have to stand in the open air. But with plenty of straw inside the occupant will be snug enough.

How to finish kennel.

771. The kennel shown in Fig 445, and just described, is a movable one; but the kennel of which an illustration is given in Fig 448 is a kennel that may be fixed and permanent, or movable from place to place just as the maker may determine. It is what may be termed a composite or triple kennel, as it affords housing for three dogs. As the reader will readily understand, such a kennel will be of very great weight, and if intended to be moved at any time it should not afford room for more than three dogs; but if it be permanent and regarded as a fixture, it may be made as long as the home carpenter likes. I shall describe this kennel as if it were going to be permanent: the home carpenter by this time must know as well as I can tell him what to do to render it movable, but I may as well point out now for the benefit of those who are beginners in carpentry, that this kennel, in point of fact, has no floor and no back, but that if it were to be movable it must have both floor and back, and rest on at least three blocks of timber placed under it, one at each end and one in the middle, so that the air may pass freely underneath the bottom of the kennel, by which means, namely, the raising of the kennel above the ground level and the thorough ventilation below, the bottom is not permitted to absorb moisture from the ground, and is therefore rendered far more durable than it would be if it were in direct contact with it.

Composite kennel for three dogs.

772. The kennel shown in Fig. 450 is drawn on a scale of $\frac{1}{2}$ inch to 1 foot, and is supposed, on this scale, to be 6 feet long, 2 feet 6 inches wide or deep, and 2 feet high in front and 3 feet behind. The length, or rather width, of the roof from front to back, as shown in the diagrammatic sketch of end, or section, of kennel, given in Fig. 448, is 2 feet 9 inches. This sketch-diagram is only of importance and utility so far as it will help to explain my remarks as I proceed. The first thing to be done in building such a kennel is to put together four solid pieces of timber, two of them being 6 feet 4 inches long, 6 inches wide, and 3 inches thick, and two

General dimensions of triple kennel.

2 feet 11 inches long, 5 inches wide, and 3 inches thick. Halve the ends of these together, and, until the mortises for the uprights are made, connect them by slips nailed diagonally across the corners. This will hold the pieces together, which, when connected, are intended to form an open platform on which the superstructure of the kennel is to be reared. The rectangle formed by these pieces of timber should rest on a substratum of bricks or concrete, to receive which the ground should be accurately hollowed. It is desirable to put the bricks or concrete all over the entire surface, and not on four rows of brick so disposed that the timbers of the rectangle may rest upon them while all the intervening space is empty. Moreover, a bearing is wanted for the cross pieces that run from front to back, and are halved or mortised, as the inclination of the home carpenter and his skill in carpentry may lead him to determine, into the longer pieces of the framing.

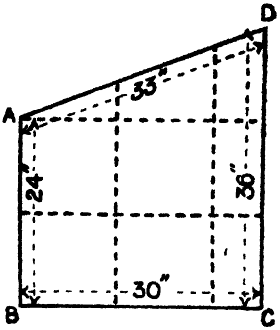


Fig. 448. Diagrammatic Sketch of End or Section of Triple Dog Kennel.

773. A plan of the framing, on a scale of ½ inch to 1 foot, is shown in Fig. 449, and in this A A′, B B′ are the longer pieces of the framing; C C′, D D′ the shorter pieces, and E E′, F F′ the two transverse pieces from front to back, which, although they are of the same length and thickness as C C′ and D D′, are only 34 inches wide—a width which is wide enough for the purpose to which they are put, namely, to afford a bearing and means of attachment for the partitions which divide the kennels, or, in other words, the three compartments of the triple kennel. When the parts of the framing are ready, and connected by diagonals attached to the lower surface of the framing, put it on trestles, and, having marked a space of 2 inches inward from the outer edge, draw a pencil line all round, defining it as strongly as possible. Within this outer line set off spaces for

Framing on which to construct kennel.

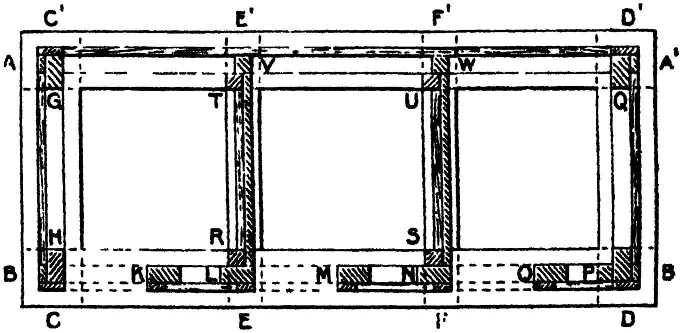


Fig. 449. Plan of Triple Kennel, showing Foundation, Uprights, etc.

an inner line, just 1 inch from the line first made, and mark this also in pencil as strongly as possible. These lines define the position of the weather boarding with which the top, front, sides and back of the kennel, if it be movable, are covered in. These are so clearly defined in Fig. 449 that they need no lettering. The space between is shaded with a wavy line. The *raison d'être* of the sectional pieces at the corners indicating vertical slips will be explained presently, when reference to them is absolutely necessary.

Provision for mortises to receive uprights.

774. It will be as well to make the uprights, to which the weather boarding is to be nailed, of pieces of timber 2 inches thick. Some of these will be 2 inches square, and others will be double this width, that is to say, 4 inches by 2 inches To show where to make the mortises to receive the tenons of the uprights, set off a space, 2 inches wide, within the inner of the two lines already made, and define the lines that mark the space strongly in pencil as before. This will be the last of the parallel lines on the surface of the rectangle that will be required: the innermost line merely indicates the inner edge of the framing. We must now determine the places where the uprights will come. and where the mortises to receive them must be made The uprights lettered G, H, K, L, M, N, O and Q are double uprights, that is to say, 4 inches wide and 2 inches thick; the upright shown at P looks like a triple upright: it is so to all intents and purposes, but it is easily made by screwing a single upright, 2 inches square, to a double upright, 4 inches by 2 inches. It has to turn a corner in which the weather boarding appears to meet, and it is to receive the edges of weather boards that are at right angles to each other that this formation is necessary. The rest of the uprights at R, S, T, U, V and W are merely single uprights. They are in contact with others, it is true, but they are independent of them, and where they can be attached the attachment must be effected by screws.

Definition of position of uprights in front.

775. We must now proceed to space out the front, in which the greater number of uprights come First of all a space, 4 inches by 2 inches, must be marked to receive the upright at H, due regard being had to the fact that the narrow part faces to the front. A space of 10 inches is then marked off for the entrance to the first compartment of the kennel, then a second space of 13 inches, which is closed up. Then comes an open space of 10 inches, which forms the entrance to the second or middle compartment, and another of 14 inches, which is closed up Thirdly comes a third open space of 10 inches, which gives access to the interior of the third compartment, and after this another space of 13 inches. Summing these up in the order in which they are given, we find that we have 2″ + 10″ + 13″ + 10″

+ 14″ + 10″ + 13″ = 72 inches, which is the length of the front originally fixed on, exclusive of the weather boarding, for which due provision was made at starting

Provision for wallplate to kennel

776 The mortises all duly cut, the tenons at the lower end of the uprights made, and the uprights fitted into their places—I have said nothing about mortising at G, V, W, Q and the portion annexed and screwed to P, because these present no difficulty—the next thing to be done will be to provide for a wallplate at front, back, and sides, which, with three rafters intermediate to those at the sides, will sustain the roof. The kennel is to be 2 feet high in front and 3 feet high behind, so measure off 2 feet on the outer face of the end uprights in front—the uprights being all fitted in their places—and 3 feet on the outer face of the end uprights behind, and with a straight edge applied to the marks thus obtained, draw a line touching the outer faces of the uprights H, K, L, M, N, O, P in front, and G, V, W, Q behind. Also draw diagonal lines on the end faces of G, H and P, Q, which will show the slope of the wallplate at the ends of the roof. Then, having duly marked the tops of the uprights all round with square and bevel, and prepared them with the proper lines either for mortising and tenoning into the wallplate, or halving, as the home carpenter

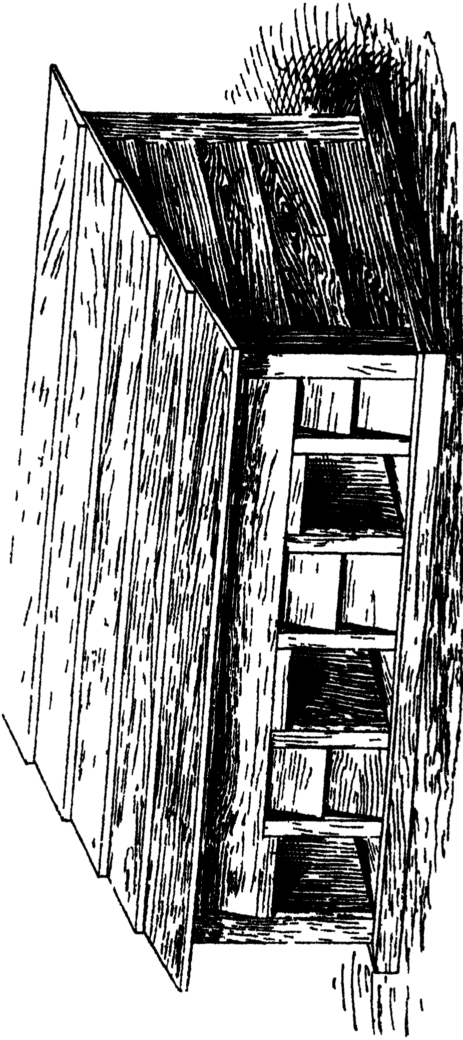


FIG. 450 Triple Kennel for Housing Three Dogs

may decide, cut them off and do everything else that is necessary for this part of the work. In putting on the wallplate at front and back, use a piece of stuff about 2½ inches by 2 inches, rather than 2 inches square, so that the face may be reduced to the normal width of 2 inches, although the back is higher. My meaning will be made apparent by Fig. 451, in which C C′ are the end uprights at front and back; A and B the ends of the wallplate at the side, and E F sectional views of the ends of wallplates at front and back; the edges projecting upwards beyond the line of the side wallplate being taken off with a jack plane, there will be a uniform surface all round for notching on and bedding the ends of the rafters at front and back. These need not give very much trouble. Notch each end sufficiently to secure a firm lodgment at front and back, and then lay on slips over the wallplates at the ends to bring them up to the level of the three intermediate rafters

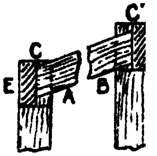


FIG. 451. End View of Uprights and Attachment of Wallplates at Front, Back, and Sides.

Completion of framing: entrances.

777. All the parts are now ready for putting together and fastening up; but before doing this, take a batten, 2 inches by 1 inch, and halve it all along the front from the upright H to the upright P, letting it into K, L, M, N and O. The length of the batten will, of course, be 6 feet. It will strengthen the framing of the triple kennel very materially if additional uprights are put between G and H and Q and P, and even between G and V, V and W, and W and Q, but there is no absolute necessity for doing this. The object of the batten in front is to form lintels or architraves to the entrances. It will now be necessary to put on the slips shown at the four corners: these slips should be made of pieces of batten, 2 inches by 1 inch, and wood 3 inches by 1 inch. This will be better understood from Fig. 452, which affords an enlarged diagram of the corner of the kennel in front to the left. In this H is the double upright, as in Fig. 449, C is a view of the edge of the batten halved into the uprights along the front from one end to the other of it. The corner slips are shown in section at A and B, A being the longer of the two. It is better to place this in the front, as the joint is less perceptible when at the side, as in this case, between A and B. The object of the slips is to afford suitable projecting parts, against which the ends of the weather boarding may butt and be hidden from view, as shown by E, which is supposed to be a part of the weather boarding between H and G. On looking at Fig. 450, in which a view of the triple kennel is given complete, it will be noticed that a framing surrounds

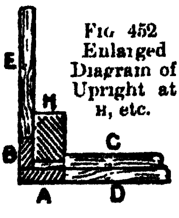


FIG. 452. Enlarged Diagram of Upright at H, etc.

each entrance at sides and top. This framing is formed by screwing on pieces of batten, nicely planed up, to the uprights and the batten that runs from end to end of the front. In Fig. 452, C, as it has been said, shows this batten, and D, the piece that is screwed on to form the outer part of the lintel of the entrance, to the left.

778. All parts of the framing being now ready, the uprights must be placed in position and the tenons secured in the mortises by wooden pins. Now put on the batten halved into the uprights, and screw this into place, and then put on the wallplate pieces all round, and fasten them. Now will be the best time to provide the floor of the kennel. This may be done by filling in the space between the heavy framing that rests on the brick substratum below it with brick paving, concrete, or wood paving. Of the three, wood paving would, perhaps, be best, because it would be warmer for the dogs, although, with plenty of litter to lie on, the coldness of the brick paving or concrete would not be felt. Then put up the partition between the kennels. Form these of 1-inch boards: they are indicated by the diagonally shaded parts between R and T, and S and U. Secure them at the bottom by means of slips, 1 inch square, nailed to the cross pieces of the heavy framing to serve as stops, shown by the parts, also between R and T and S and U, shaded in short straight lines. The sides, as a matter of course, are nailed to the uprights R T and S U, and the bottom is then nailed to the slips or stops just mentioned. The amateur woodworker must bear in mind the necessity of doing all this before the roof is put on, or even the weather boarding at front and sides and at the back as well, if the kennel is intended to be movable, but not otherwise, as then the back of the kennel would be formed by the building against which it is placed. In this case, the piece that forms the back of the heavy framing at bottom need be no more than 4 inches in width and the uprights G V, W, and Q would be fastened to the wall of the building against which the kennel is placed, whether of brick, stone, or timber.

Paving for floor of kennel.

Putting up the partitions between compartments.

779. Nothing now remains to be done except to put on the weather boarding; and the way this is done is self-evident from Fig. 450. There is only one way of putting on weather boarding, and that is to begin at the bottom and work upwards. Feather-edged boards used in weather boarding are from ¾ inch to 1 inch thick at the thick side, and taper off to about ¼ inch at the thin side or edge. Pass the jack plane over each to take off the roughness, because they will then be all the better and easier to paint, if the kennel be painted on the outside, as doubtless it will.

Covering in with weather boarding.

The boards are 9 inches in width, and the thick edge of each board in succession should lap for about 2 inches over the thin edge of the board below it. This gives an apparent width of 7 inches to each streak of weather boarding. When the front, ends, and back, if necessary, have been covered in, the roof must be put on. The length of the boards for the roof will be 6 feet 8 inches, as the length of the kennel itself is 6 feet 2 inches, *including* corner slips and weather boarding, for this makes 1 inch extra on each side, and, as the reader will remember, the length from outer face of H to outer face of F was exactly 6 feet or 72 inches, as was shown. The roof should lap over at front and ends, and back too, if the kennel be movable, for 3 inches every way, and thus the length of 6 feet 8 inches is fully accounted for. If movable, a slip of wood should be nailed to the top of the back, and between this and the upper edge of the feather-edged board, a thin slip should intervene, to which the thin edge of the board should be screwed in order to secure it against any chance of fracture. My meaning will be clear from Fig. 453, in which A represents the last feather-edged board of a roof, B the wallplate, and C the upright. I have not shown any weather boarding at back of C as it is not a complete and perfect diagram to scale, but only a rough sketch; D is the fillet, nailed to the back, and E the slip intervening between D and the thin edge of the last board on the roof. The object of D is to give strength and support to the slip F, and so render the finish stronger and more substantial. The triple dog kennel may now be regarded as finished and ready to receive its occupants, after it has been painted.

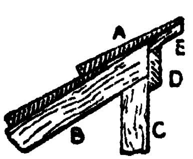


FIG 453 Diagram showing how to secure Thin Edge of Feather edged Board against Fracture

780. It may be that the home carpenter has a special pet of the genus *Canis* which is about to present him with a litter of puppies, and that no kennel that he may happen to have is exactly suited to meet the exigencies of the coming event. He determines to make one that shall meet all these, such as they are; and on reflection he finds it desirable so to build the kennel that inspection of the puppies may be possible at any time, that there shall be an enclosed space in front that shall compel the puppies to keep at home, and, thirdly, that the mother may be able to leave the kennel and return to it whenever she may be pleased to do the one or the other. The construction of the kennel and fore court, if I may call it so, will be easily recognised from Fig. 454.

Kennel for litter of puppies and mother.

781. The kennel itself is so made that it may stand in the open or under

cover. It is immaterial, however, where it is placed, because the roof is impervious to rain, and the fore court as well as the kennel itself is covered in. It will be noticed, first of all, that the kennel is made in two parts—the back part and fore part being both distinct in themselves, so that, if it were needful, the kennel itself could be used as such independently of the fore part. It will be seen, too, that the special requirements that were touched on in the last section have been met, thus inspection of the puppies at any time, or removal of straw for the introduction of fresh clean straw, is attainable by means of the part of the roofing of the kennel at A, which is attached to the ridge piece by T hinges, and is fastened down about the centre of the lower edge by a staple and padlock. The abstraction of any of the puppies, or the whole lot of them, when everybody's back is turned, is thus rendered impossible, unless the dog stealer turns burglar and effects burglarious entrance to the rearward part. Secondly, when they are old enough and strong enough to move about a little, they may get so far as the fore court, but no further, as the barred surroundings prevent. Lastly, the end of the fore court at B is made in two parts, and the upper part is attached to the lower part by hinges. The entire end is attached and held to the sides and roof of the fore court by hooks screwed to the roof and framing of the sides and dropped into eyes or loops of staples, driven into the two parts of the end. Thus, when the hooks that are screwed to the roof, or which work about screws put into the roof, are unfastened and withdrawn from the eyes into which they drop, the upper flap of the end will turn downward over the under part, and the mother animal can pass in and out of the opening thus made at pleasure. In like manner, if it be determined at any time to let the puppies go further afield and see a little more of the world than they have hitherto done, it is easily managed by releasing the hooks that hold the under-part to the sides. Mother and children can always be secured for the night,

Construction of kennel.

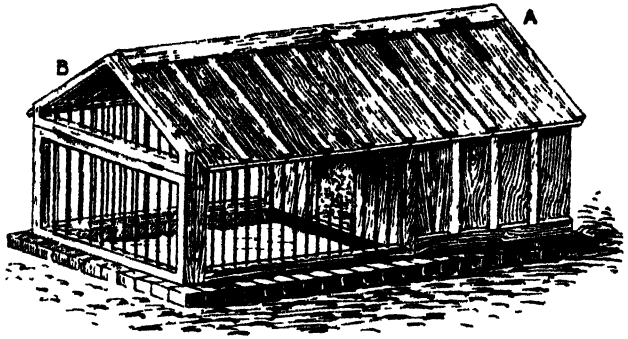


FIG. 151 Kennel with Fore Court for Litter of Puppies

when the former only is permitted to go in and out by putting up the top flat and passing the points of the hooks into the eyes intended for their reception.

Connection of fore part and back part.

782. Returning to the gеneral construction of the kennel, and the connection between front and rear, it will be as well if it rests on a platform of bricks, put together after the manner of a frame, or a frame of wood, as in the case of the kennel shown in Fig. 450. In Fig. 454 a framing of bricks is shown: this admits of a circulation of air under the floor of the kennel, which should be a substantial wood floor. One side of the roof of the rearward part lifts, and the slip, the fifth in numbering from the right end of the roof, overlaps the lid of the sleeping part and the roofing of the other side, so as to cover the line of junction between hind part and fore part and prevent the entrance of rain. The two parts are connected by 6 hooks and eyes, three on one side and three on the other, placed in positions shown in the diagram.

Construction of the fore part of kennel.

The roof.

783. The fore part of the entire kennel is made in four pieces, if the two sides of the roof be joined together, but for convenience of stowage at any time, and for the sake of strict accuracy, it may be as well to say six; that is to say, six numbering the two barred frames that compose the sides of the fore court, the two parts of the roof, and the two parts of the end. To make this as clear as I can, I have given in Fig. 455 a rough sketch diagram--not to scale--of a section of the fore court, and a view of the end in dotted lines. About this elevation of the end little need be said, because such parts of its framing as would be visible, the rails in which it divides, and the bars can be easily recognised. Every part that is shown by dotted lines belongs to the end, and the outline of the end corresponds exactly with the outline of the section of the structure. With regard to the solid part of the diagram, A and A′ are bricks in the rows of brickwork on which the kennel rests; B D and B′ D′ are sections of the upper and lower rails of the side frames, and C C′ are two of the vertical bars which run from the top rail to the bottom rail, E and E′ are sections of the opposite sides of the roof. If these are made in separate parts, as they really should be, they should form a right angle at the ridge. The part E should be screwed firmly to the arris rail, or *quasi* arris rail, F, and these should be regarded as permanently fixed. When the roof is

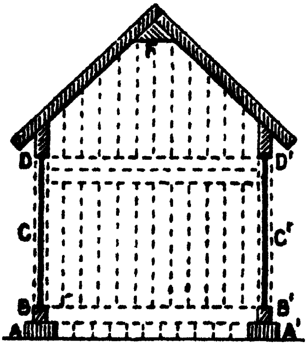


FIG. 455. Sketch Diagram of Section of Fore Court.

in use and in position, E′ should be screwed down to F, and a few screws put through the upper part of E into the edge of E′, to draw the parts of the roof as closely together as possible before E′ is screwed down to F. Long thin screws should be used, say 2-inch or 2½-inch screws, and great care should be taken in boring holes for their passage through E, so that they may enter the edge of E′ truly, fairly, and accurately along its centre. This is all that it is necessary to say about the kennel, unless it be to caution the reader that the dotted lines between A and A′ represent the ends of bricks below the lower portion of the end, and are not to be taken as continuations or prolongations of the bars above. For the bars, a wire ranging in diameter from ⅛ inch to $\frac{3}{16}$ inch will be sufficiently strong. Take care that the holes bored in the framework for the reception of the wires are well and truly made. Mark the central line on the opposite sides of the framing, through which the wires have to pass, with a marking gauge, and, if the home carpenter is the happy possessor of a drill, by all means let him use it in carrying out an operation of this kind which involves considerable care to get through it properly.

Ornamental tub kennel.

784. I am afraid, however, that my readers are beginning to think that my suggestions and designs for dog kennels are somewhat prosaic, and savour too much of hard and fixed lines, vertical, horizontal, and diagonal, and lack that ornamental character which I like so much myself, and which, I am prone to believe, a good many others like, too. In order, then, to retrieve myself in the eyes and estimation of such as these, I bring this chapter to a conclusion with designs and instructions for making what I am compelled to call the "Tub Kennel," because its basis, its core, or nucleus about which it is evolved is nothing more than an ordinary tub or flour barrel, which can be bought from most grocers and millers at from 6d. to 1s. I am afraid the name "Tub Kennel" will send the expectations I have been endeavouring to excite in the minds of my readers down to zero, or 32 degrees below freezing point, as our thermometers or heat measurers tell us. Nevertheless, a look ahead and a glance at Figs. 456 and 457 will calm any qualms of apprehension that may be beginning to rise, and show that the tub kennel is by no means as ordinary and plain in appearance as its name implies, but, on the contrary, that it will be fair to see when finished.

Supposed dimensions of tub for kennel.

785. First of all, then, obtain a tub or flour barrel, and as tubs are of all sorts and sizes, and in considering matters of this kind we are bound to proceed on hypothesis, let us suppose that the tub we are going to convert into a dog kennel is 18 inches in diameter, outside measurement at each end, 20 inches in diameter in the widest part, and 33 inches

high. These proportions will be near enough to the real thing for us to work on; but home carpenters who desire to make a kennel on this plan must make working drawings for themselves on the lines laid down suited to the dimensions of the tub they have purchased, taken at the ends and middle vertically when the tub is laid on its side, or placed on trestles, and from end to end horizontally or transversely. Such a tub will afford accommodation for a good-sized dog, and will be found to be well worth the making. A paraffin or oil cask will be almost better for the purpose in view than the cask named, as these are headed in at each end, but, on the contrary, in the other kinds that have been mentioned are headed in at one end only, and the home carpenter will have to make a head for the other end - the end that is shown in Fig. 457 in front elevation; but this will not be found to be such a difficult matter as might be supposed at first, although work of this kind might be entirely avoided by getting, as I have suggested, an American oil cask.

786. However, an American flour barrel is by no means to be refused, and the first thing to be done is to make two transverse pieces of the shape shown in Fig. 456. The cask or tub is circular in transverse section, parallel to the ends, and swells from ends to middle, where it assumes its greatest girth. The greatest trouble in the flour barrels, and, indeed, with many of the rougher kinds of casks, will be the hoops, which are very irregular and, in some cases, shapeless in form, and that is why I recommend the paraffin casks, whose hoops are of iron, and therefore thinner and more regular. Owing to the swell of the cask both ways from ends to centre, the portion on which the cask or tub rests must be cut on the bevel, which must be ascertained by applying the bevel itself to the cask within or without as may best serve the purpose. The slant of the bevel is shown at the ends of the piece that is to be removed at E, in Fig. 456, and in the centre at F; so two curves, namely C, must be described on both sides, and a single dotted line below the first solid curve to the depth of the difference in height between the outer and inner edges of the slanting top of either section at E or F. Take a rectangular piece of wood, of the form shown at L in Fig 456. The arc C and the dotted arc below it must be struck out by compasses; and in order to get the centre it will be necessary to butt the piece L against the end of

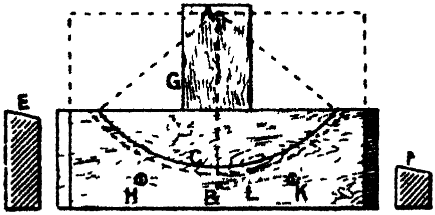


FIG. 456. Mode of Making Stand for Cask

Stand for tub kennel

another piece G, both being secured to the bench so that they cannot shift Then draw the line A B through the centre of the surface of D, taken vertically, and let it be perpendicular to the bottom edge of D. Ascertain the diameter of the end of the cask—in the case now under consideration we have assumed it to be 18 inches—and then, taking half the length of L, or half the diameter of the cask as radius, describe the arc C and the dotted arc below it. The length of L must be 2 inches more than the diameter of the cask, so as to allow 1 inch at each side for the tenons, which must be slightly rebated and mortised into the centre of the uprights that support the roof, and butt against the edge of the cask on each side. The height or depth of this piece, call it which you will, should not be less than 6 inches and not more than 9 inches. Its purpose is to keep the cask off the ground and to furnish means of steadying the cask and keeping it in an upright position. The easiest way of going to work is to divide the lower edge of D into two equal parts in the point B, and then draw the straight line A B perpendicular to the lower edge of D. This done, the point A is easily determined, for we can assume a position for the point C—say about half the height of the piece D, or a little less—and then measure off from C to A half the diameter of the cask, outside measurement, or half the length of D, without including the tenons, as radius of the arc C.

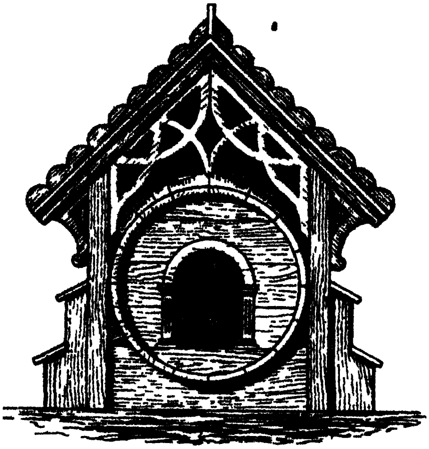


FIG. 457 Ornamental Tub Kennel—Front Elevation.

Completion of stand for tub.

787. When the arcs have been properly struck on each of the pieces on which the cask is to rest, and preferably on their inner surfaces, the wood, as far as the arc C, must be cut out with a compass saw, and then the bevelled portion must be worked with a spokeshave. This done, the tenons on each end, which have already been duly marked out, must be rebated to enter the uprights, which are 2 inches square. There is no necessity to cut one long tenon, as drawn; it will be sufficient to make two narrower tenons about 1½ inches long, one about ¾ inch from the topmost edge, and the other the same distance from the bottom edge. The wood used for the stand should be about 1¼ inches thick, and the tenons ¾ inch wide.

This would allow of a rebate ¼ inch on each side, which will be sufficient. The arcs being completed, and the tenons finished as well, holes should be bored at H and K in each piece, and they should then be connected either with mopsticks or with square rails, with the ends cut to enter the round holes, which may be made with a 1-inch bit. This completes the stand which receives the ends of the tub, and so carries the tub itself. The ends of the tub should project slightly—say ½ inch—beyond the ends of the stand.

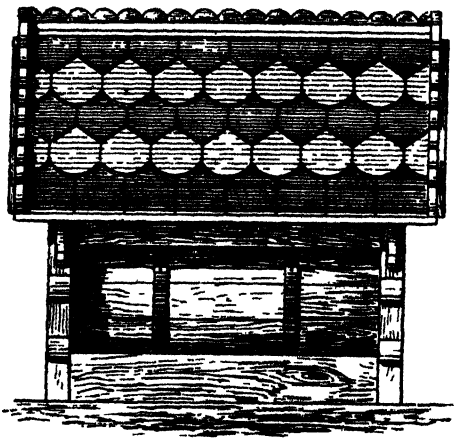


FIG 458 Ornamental Tub Kennel—Side Elevation.

788 As the dimensions of the kennel must depend so much upon the size of the cask, I do not give them here in detail; but as Figs. 456, 457, and 458 are drawn on a scale of ¼ inch to 1 foot, the home carpenter will have no difficulty in determining these, as far as the diagrams themselves are concerned, based as they are on the dimensions of the cask used as assumed above. The next thing to be done will be to prepare four pieces of quartering for the uprights, into which the ends of the pieces that form the stand are mortised, and which form the supports of the roof. Fig. 459 shows the foot of one of the uprights and the mode in which the stand and the side rail, shown in Fig. 458, are mortised into them. Thus the mortises at A and B take the tenons of the standard C, that of the lower rail that runs from the upright in front to that at the back. A similar provision must be made for the top rails on each side, and the tops of the uprights must be tenoned diagonally to enter mortises cut diagonally in the pieces of quartering that form the principal rafters of the roof at front and back. This done, and all these parts—namely, the four uprights, the rafters in front and rear, the hollowed pieces of the stand and the side rails at top and bottom—being put together and fastened up by screws, nails or pegs, as the home carpenter may choose, the framing that encompasses the cask and forms the roof is complete, and ready to receive the scalloped ridge piece which runs from front to back, and which must be dropped into

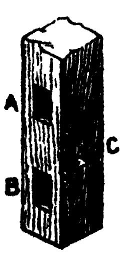


FIG. 459. Mortises at Foot of Upright.

notches cut for its reception at the junction of the rafters at the apex, or the ends of the rafters may be shortened, each to the extent of half the width of the ridge piece, which should be 1 inch in thickness. The ends of the rafters at the top are then nailed to the ridge piece, and additional firmness and stability may be given to the roof by the addition of one or two slighter rafters, whose upper ends are nailed to the ridge piece, and the lower ends notched on and nailed to the top rails on each side. The little buttresses, shown in Figs. 457, 458, are pieces of quartering cut in the manner shown. As these are 2 inches square, the best way of fastening them to the uprights is to bore holes with a ½-inch bit in the centre of each, taken vertically, to the depth of 1 inch, and then to attach the first and longer piece to the upright, and the second and shorter piece to the first piece, plugging up the holes, to the bottom of which the 2-inch screws used have been driven with pieces of wood. Pieces must then be nailed over the diagonally-cut top of each, as shown, to cover in and conceal the end grain of the wood, protecting it in fact from rain and the influence of the weather.

Provision for roofing over tub kennel.

789. Before putting on the boards that form the roof it will be desirable to insert the barge-boards and the brackets shown in Fig. 417 in front elevation. These must be cut like fretwork out of stout boards, not less than ¾ inch thick for the barge-boards, and 1 inch thick, at the least, for the brackets This done, the scalloped crest-boards should be prepared and fixed. These should also be 1 inch in thickness, and of a sufficient width to cover in the whole of the end rafters, to which they must be nailed or screwed. The roof, as will be seen from Fig. 417, is made to overhang each end of the kennel for 3 inches, and so it will be necessary to screw on another piece of quartering 2 inches square to the rafters, into which the uprights are mortised and tenoned, and the cresting must be nailed to the face of each additional piece of quartering. A piece of mopstick, or, rather, half mopstick, is nailed in the form of a fillet along the cresting, as shown in Figs. 417 and 418, about midway, or nearly so, of its full width. The boards of the roof are dropped in between the cresting, and should butt against the scalloped pieces as closely as possible. In reality they are five single boards running from cresting to cresting, but they are fastened at the edges and incised with a V chisel at the apparent joining, so as to imitate tiles. The method to be followed in cutting and forming these boards in imitation of tiles has been described and explained in another part of this volume, so there is no occasion to repeat the manner of forming them here. The boards must be firmly screwed or nailed with wire nails to the

Barge-boards and brackets.

Cresting at ends of roof and boards of roof.

principal and lesser subsidiary rafters, and if this is done it will prevent the roof being drawn and warped by the influence of the sun.

790. I must not omit to draw attention to the entrance to the kennel. To form this a hole is cut in the end with a compass saw, or, failing this, a strong key-hole saw. Vertical bars should be put inside the kennel, on each side of the hole, and the ends of the boards that are cut through must be screwed down to them. The ornamentation outside, which forms, as it were, a framing to the entrance, consists of two small pilasters and a circular, or, rather, semi-circular head above them. The pilaster and arch may be flat or rounded as the home carpenter pleases. The only thing that now remains to be done is to give the whole structure three good coats of paint. It may be dressed over with Stockholm tar if preferred, but such a mode of treatment would, I think, spoil the general effect of the ornamental work. I would prefer myself to paint it in two shades of green or two shades of terra cotta. In this case, the tub should be of the lighter shade and the hoops of the darker tint. The framing should be dark, and so should the brackets, ridge piece, and crestings; but the fillets in front and back and the barge-boards, as well as the fillets nailed above the topmost board of the roof, should be light. The head of the cask may be dark and the ornamentation round the entrance light. The boarding, or *quasi* tiles, of the roof may be alternately dark and light—the first, third, and fifth boards being dark, and the second and fourth light. This will give a pleasing effect to the kennel, and prevent the monotony which is unavoidable when one tint only is used.

Ornamentation of entrance.

791. Of course, it is possible that in a little farmstead there may be some corner, or out-of-the-way spot, on which a kennel may be put up without much trouble. Such may sometimes be found in angles formed by the junction of two walls at right angles. Here, however, the kennel must, as a matter of course, take the form of a small miniature shed, with front, side, and sloping roof. The mode of making such a retreat and lodging for the dog has been described so often with respect to other buildings of a similar sort, that there is no occasion to repeat instructions on the subject. The chief point to be looked after is the prevention of the ingress of water at the junction of the roof with the walls, etc., against which the kennel is built; and this is best effected by attaching a little fillet of cement to the walls over the line of junction. This will secure a dry lodging for the inmate of the kennel, and will promote its comfort, which should be looked after for all animals.

Kennels in corners.

792. Messrs. Boulton & Paul always keep in stock a large and varied

stock of dog kennels of all kinds and sizes, and some of these offer special advantages in being fitted with a platform which fits under the kennel itself, and can be drawn out from under it or pushed in below it at pleasure. The addition of a platform in front of the kennel, and especially platforms of the kind named, which can be brought into use or not, is a great improvement to the kennel itself and a step in the right direction, because it can always be kept dry when out of use under the kennel, and drawn out for the dog to sit or lie down on whenever the ground has been rendered too damp for the dog by heavy downpourings of rain. In a previous section, when writing of the sizes of kennels, I specified 2 feet in length, 2 feet 6 inches in height, and 1 foot 6 inches in width, as a convenient medium size of kennel for dogs of average size. I quote from Messrs. Boulton & Paul's price-list the following sizes for dog kennels, which will afford useful information on this point to the home carpenter. They are: (1) For terriers, length 2 feet 6 inches, width 1 foot 4 inches, height 2 feet 5 inches; (2) for collies, spaniels, or retrievers, length 3 feet 6 inches, width 2 feet 3 inches, height 3 feet 4 inches; (3) for St. Bernards or mastiffs, length 4 feet 6 inches, width 2 feet 8 inches, height 4 feet 6 inches. Another speciality of Messrs. Boulton & Paul's is a travelling box for dogs, which has a door in front, against which a projecting bar is fixed to prevent luggage from being placed close to the bars. In this (the door) is a frame hinged to one of the sides as a hanging post, and having round iron bars of no great calibre running vertically from top to bottom of the framing. It has ventilating holes on each side near the top. The travelling box is made in three sizes, as follows:—No. 1, 22 inches long, 20 inches wide, 24 inches high; No. 2, 36 inches long, 20 inches wide, 27 inches high; No. 3, 42 inches long, 30 inches wide, 33 inches high. The dimensions of the travelling boxes, as just given, are presumed to be in accordance with the dimensions of kennels given above for these sizes of dogs, of which the terrier, collie, and the St. Bernard are fair representatives.

Platforms in front of kennels.

Travelling boxes for dogs.

CHAPTER V.

THE STABLE: ITS FITTINGS, ADJUNCTS, AND GENERAL EQUIPMENT.

Small Stable for One Horse—Details of Stable, or Building to serve as Stable—Adaptation of Building as Stable—Provision of Loft for Stable—Door in Gable End of Stable—Joists and Floor of Loft—Opening over Rack—Partition between Parts of Stable—The Manger—The Rack for Hay—Door, Paving, and Ventilation of Stable—Utilisation of Remaining Space in Stable—Light Ladder for Stable Use—Mode of making Ladder—Saddle-Tree, or Bracket for Saddle—About Corn-Bins—Rectangular Corn-Bin—Construction of Corn-Bin—Free and Movable Partitions—Free Top, or Cover to Bin—Principle of Box Hinges—Circular Bin for Corn, etc.—Shortening Cask—Substitute for Hooping to Cask—Construction of Wooden Framing round Top of Cask—Cover to Circular Corn-Bin—Making Lid, or Cover, to Circular Bin—How to render Lid Dust-proof—Stable Pails—Repair by Tinned Plate—Tinned Plate: How obtained and how shaped—Bass Brooms—Construction of Bass Broom—The Squeegee—Construction of Squeegee—"Jersey" Company's Stable Water Trough—Corner Galvanised Iron Manger—Portable Manger—Galvanised Iron Hay Racks.

793. STABLES and coach-houses are usually buildings of a substantial character, built of brick, stone, or some other building material.

794. Instead, then, of attempting to give instructions for building a stable proper, I shall seek rather, in the present chapter, to show how an out-building may be conveniently adapted to form a stable for a single horse or pony, and the fittings and furniture, so to speak, that will be required to impart something of the aspect of a stable. Let us suppose that it is a building with solid walls, having two gabled ends and a door and two windows in it, one on each side of the door. Let us suppose it to be about 16 feet in length and 12 feet wide, outside measurement; and let us further suppose that the walls are 8 feet in height in front and at back, and say 14 feet above the ground level at the gable points. The reader will at once understand from Fig. 460 the kind of building I have in my mind. In all probability no one into whose hands this volume may come may have a building precisely on the same lines as this; but be it what it may, if he has any building of the kind, my instructions will help him, at all events, to adapt it to the purpose required, and if he is in the mind to build one, it will give him something to go by in preparing his plans.

Small stable for one horse.

795. Looking at Fig. 460 the home carpenter will note that the building represented therein has a door in the centre of the front and two

Details of stable, or building to serve as stable.

small windows, one on each side of the door, as said above, and that there is also a door in the gable end shown in the illustration. I shall have more to say about this door presently. It is not supposed to be in the building as originally constructed. Had it been there it would have served no useful purpose. We will suppose that the building was simply composed of four walls, built as shown—built of brick or stone, and covered in with a tiled or slated roof without ceiling, and, therefore, having the rafters, the transverse spars, battens, or slips of wood on which the tiles are hung by means of tile pins, and the under surface of the tiles themselves, exposed to view. Further, we will suppose it to be a building roughly erected and with no pretension to finish, put up as a sort of barn or store house for wood, roots, or anything else requiring storage and protection from the weather, that it might be found desirable or convenient to place within it—a superior and better kind of shed, in fact, capable of being locked up at pleasure, and holding an intermediate position between the shed pure and simple, and a building designed in the first place to serve as a stable. The walls we will take to be 9 inches thick, which will bring the space within the building to 14 feet 6 inches in length and 10 feet 6 inches in width. Let us hope that the walls were provided with a damp course, and are, therefore, dry, although the floor, perhaps, is nothing more than the bare earth consolidated by frequent use. It is devoid of anything in the form of flooring, whether of concrete, or brick paving, or paving of cobble stones, or pebbles. The dimensions given are followed out in Figs. 461 and 462, of which the former is

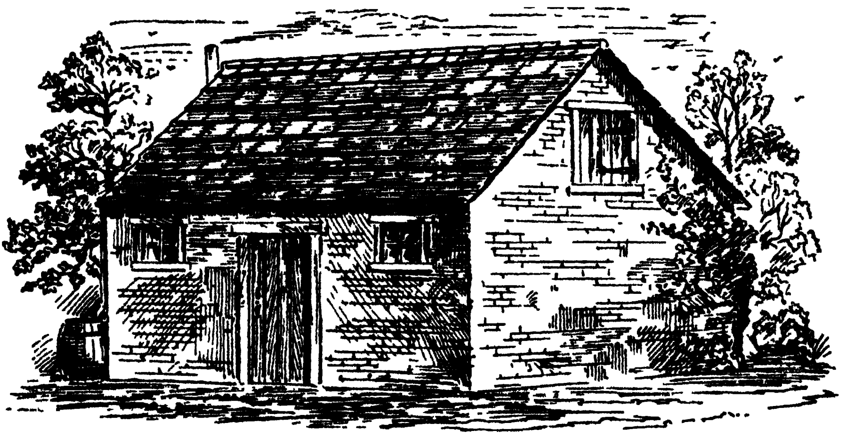


FIG. 460. Perspective View of Small Stable for One Horse.

the plan and the latter a section of the building drawn on a scale of $\frac{1}{8}$ inch to 1 foot, a scale just large enough to show every part that is needful to show with sufficient clearness and distinctness of detail.

Adaptation of building as stable.

796. The interior of the building that we are going to convert into a stable has at present nothing whatever within its four walls, and, as I have said, it is open from the earthen floor to its tiled or slated roof. Our first inquiry must be as to what is sufficient space for a stall for a horse. Now, a space from 9 to 10 feet by 8 to 9 feet, the longer distance representing the length of the stall as the horse stands with its head towards the manger, and the shorter distance the width of the stall from side to side, affords plenty of room for any horse, and is large enough even for a loose box in which the horse is not haltered and tied to the manger, as it generally is in a stall that is not closed. In point of fact, a length of 8 feet by a width of 7 feet is quite enough for any pony, cob, or small horse. In Fig. 461, however, I have taken the width of the stall at 8 feet, and the length practically at the width of the stable within the walls, which is 10 feet 6 inches. If, however, the space be taken at 8 feet square, it will be large enough, and a loose box may then be contrived by bars placed across the lower end of the stall, in the dotted line A B, and fitted into notches formed by nailing cleats to the posts A and B. This, however, involves the trouble of removing the bars every time the horse is taken out of the stall, and putting them up again every time it is put in, so it is better either to tie the horse up to the manger with a halter or head stall, or to convert the whole space on the left-hand side of the stable into a loose box, when the entrance door is closed, by putting up another door, as shown at C, hinged to a slip of wood attached to the hanging post of the entrance door and falling against the partition which divides the stall which is appropriated to the horse from the right-hand side of the stable.

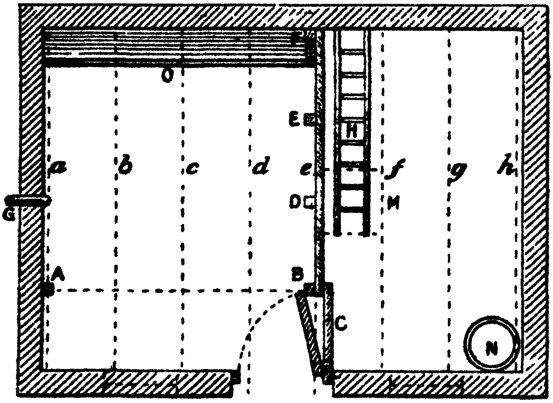


FIG. 461. Plan of Stable showing Arrangement of Interior.

797. But before I proceed with a description of the fittings of the stall,

I think I had better explain the means taken to provide a loft in the stable, which is shown in Fig. 462. For my part I much prefer having a loft above the stalls, in which hay and all such fodder can be stored, and passed down from the loft, when requisite, into barred racks, whence it is pulled by the lips of the horse. Where there is no loft above, and, therefore, no racks, the manger is divided into two parts—one shallow, for oats, chaff, etc., and the other deep, for hay and vetches, or tares, as this green fodder is called in some parts of the country. When the hay, etc., is put in this deep manger the animal is constantly blowing on it, and it does not come fresh with every successive mouthful as it does when pulled from the rack. Now, if the reader will look at the top of the sectional representation of the walls in Fig. 462, he will see at the top of each a darkly shaded section of the wallplates that run along the front and back walls to take the lower ends of the rafters. These are lettered G and H. It has been sought, as far as it is possible, to use the same letters for the same parts in Figs. 461 and 462, so that the identity of the parts may be evident, whether in section or elevation. Now, it will be noticed that the wallplate is not more than half the thickness of the wall, if so much, and this leaves a steplike space or ledge, which affords a suitable and convenient bearing for the joists which it is necessary to put across from wall to wall in order to carry the floor boards of the loft. As the span is not very wide, joists of the depth of 6 or 7 inches, and 1¾ inches or 2 inches thick, will be quite strong enough to support all the weight that will be thrown on them. The first and last of the series must be adjacent to and touching the inner surface of the gabled ends, and six joists placed between these will be sufficient. One of these joists is shown in Fig. 462 at K, and L L show sections of the floor boards that are placed transversely across the rafters, from one gable end to the other. When this has been carried out loft is formed.

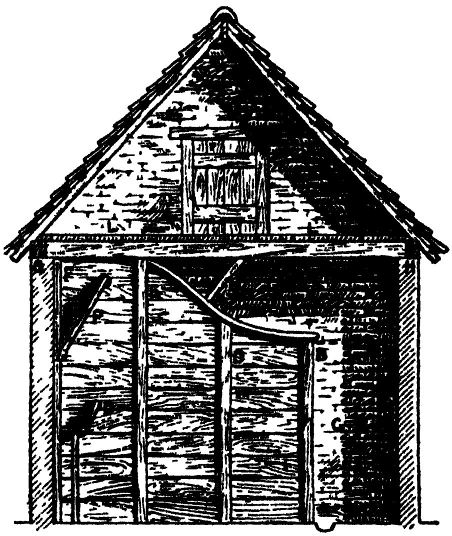

Position of loft for stable.

Fig. 462. Sectional Diagram of Stable at Partition, showing End View also of Inside of Gable with Door to Loft.

Door in gable end of stable.

798. The next point to be taken into consideration is how access may be gained to the loft; for it is manifest that, in order to deal with the fodder that is stored in it, there must, first of all, be access from without, so that the hay may be put in whenever it is necessary. I do not for a moment suppose that there will have been a door in the right-hand gable end of the original building, as shown in Fig. 460, so the home carpenter will have to call to his assistance a local bricklayer, who will cut a hole in the gable of the necessary size. This will be large enough to admit with ease a frame measuring over all—that is to say, by outside measurement—3 feet 7 inches by 3 feet. The frame must be made in the manner shown in Fig. 463, with horns in the sill and lintel that will be built into the wall when the bricklayer "makes good" the irregular interstices that intervene between the outer edges of the frame when placed in position and the ragged edge of the brick or stonework that has been cut away to allow of the introduction of a door. Fig. 463 being drawn on a scale of ½ inch to 1 foot, or $\frac{1}{24}$ size, is at once an accurate sketch of the door in detail and a working drawing. The frame should be made of stuff 4 inches by 3 inches in width and thickness for the lintel and uprights, a piece 4 inches square being used for the sill. The uprights are mortised into the sill and lintel, as shown. In fixing the frame in the opening cut in the wall, see that the upper surface of the sill is on a level with, or coincides with, the upper surface of the floor within. The door itself is 3 feet in height by 2 feet 6 inches in width. It is in no way too large, it is true. It might be made a little larger, but to do this might weaken the brick or stonework too much, and cause the fall of the apex of the gable if any time intervene between cutting the hole and making and putting in the frame and door. The home carpenter should have the frame and door ready to put in directly the hole is cut, so that the bricklayer may begin and finish his work at one time and in one operation. The narrow sides of the parts of the framing above the sill with face outwards and inwards too, the broad sides coming against the wall on the outside of the frame. Both frame and door should receive two good coats of paint before they are put in position. The door is made of four boards 7½ inches wide, fastened to ledges 6 inches wide, the ledges being placed 4 inches from the

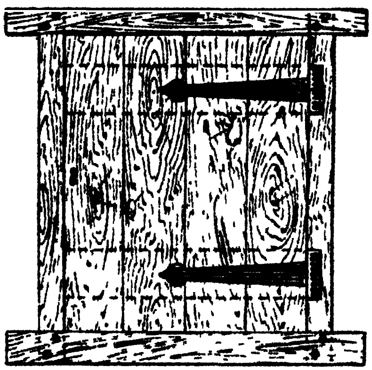


FIG. 463. Frame and Door in Gable End

top and 4 inches from the bottom of the door. Stuff from ¾ inch to 1 inch in thickness may be used for the door, which should be hung to the frame, as shown, with T or cross-garnet hinges. It should be furnished with a stout and strong wooden lock. Hang the door in the frame before the frame is put up, and nail to inner side of framing the necessary stops against which the door will fall when closed. Remove the door before the frame is put in its place, to be put in place again when the frame is fixed, for the door would be in the way of the workman while he is fixing the frame and making good the wall that surrounds it. When all is finished give both frame and door another coat of paint. Access to the door of the loft must be obtained when necessary by means of a ladder; but when hay or vetches are put in, the cart that contains them will in all probability be drawn under the door and the fodder lifted in with a pitchfork, otherwise it must be carried up the ladder and thrown into the loft.

Joists and floor of loft.

799. By this time we have got as far as putting in the joists and laying down the boards of the floor, but access must be provided to the loft from within the stable. It has been said that eight joists will be sufficient. We will take it that it has been determined to use joists that are 2 inches thick. This will bring the aggregate thickness of the joists to 1 foot 4 inches, and this subtracted from 14 feet 6 inches, the length of the stable from wall to wall, will leave 13 feet 2 inches. This remainder being divided by 7, the number of openings between the eight joists, when placed as described above, gives 1 foot 10½ inches as the width of each opening between rafter and rafter. In Fig. 461 let the dotted lines *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h* represent the positions of the right joists; the lines on which the central plane of each joist, taken longitudinally or lengthwise, would fall; very little can be seen of the dotted line *e*, because, in point of fact, it coincides with the inner surface of the partition that divides one part of the stable from the other. Before the joists are fixed, transverse pieces must be mortised into the rafters *e* and *f* to afford a framing for the manhole or trap-door through which access to the loft is to be gained from within the stable. Now, supposing that *e* and *f*, in Fig. 464, represent the joists similarly lettered in Fig. 461, and that *e f* further represents the central line of stable taken lengthwise, and, consequently, the centre transversely of each rafter, mortises should be made in the rafters 1 foot each way from the central line at A, B, C, D, and

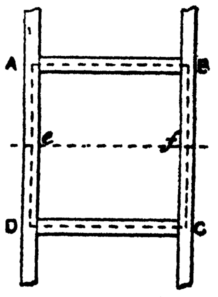


FIG. 464. Framing in Joists for Manhole or Trap Door.

cross pieces A B and C D of the same dimension as the rafters tenoned into them. It will be better to use the mortise and tenon joint in this case rather than the halved joint, because it is in itself a stronger form of joint, and care must be taken not to weaken the rafters more than can be helped by taking away, to an injudicious extent, from its absolute width when reduced by the width of the tenon at the point of junction. Fig. 464 is drawn on a scale of ⅜ inch to 1 foot. The manhole or opening for trap-door may be left open entirely or closed, at the pleasure of the home carpenter. If left open, the floor boards should be brought close up to the inner edges of the manhole, which is 2 feet long and 1 foot 10½ inches wide: but if it be intended to close it at any time, the floor boards should extend only to the centre of the joists all round, so as to leave a ledge for the trap-door to close against. Such a door, or piece of boarding, will be 2 feet 2 inches long by 2 feet 0½ inch broad. It may be hinged to the floor or not, as preferred. It will, I think, be found more convenient for it to be dropped into the aperture without hinging, and only placed over the hole when hay is being brought into the loft. All trap-doors in floors, it may be said, are made on this principle.

Opening over rack.

800. When this has been done the rafters may be fixed and the floor boards nailed down from end to end, but care must be taken to leave an opening in the floor boards over the rack in the stall, so that hay may be pushed down into it between the rafters. This opening may extend over the whole length of the rack from the joist *a* to the joist *l*, referring to Fig. 461, or only from *b* to *e*, or from *c* to *e*, as may be preferred. There is no necessity to cover it over with floor boarding, but if this is done it must be done in the manner just described for covering over the manhole. The loft is but a small one: it is not possible to walk about in it in an erect position, so there is but little danger of any one falling through, as motion from one part to another must be effected in a crouching posture, or even on the hands and knees. The loft above the stable may now be regarded as completed.

Partition between parts of stable.

801. We may now turn our attention to the construction of the partition by which the stable is to be divided into two parts. The partition will come just below the joist *e*. The first thing to be done will be to erect four uprights, as shown at F, E, D and B. It will be enough if these are made of pieces of timber 3 inches square. They may be notched at the top, to the depth of 2 inches, to the extent of the depth of the joist, measuring from the top of each upright, or only to the depth of 1 inch. This is shown in Fig. 465, in which the upright on the right is notched to the depth of 2

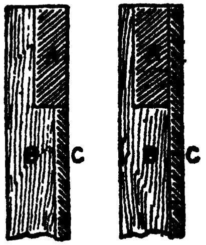


Fig 465. Connection of Uprights and Joist.

inches, and that on the left to the depth of 1 inch. In either case the upright B is brought directly under the joist A to the depth of the notch, and when adjusted so as to be perpendicular, by aid of the plumb level, the top of the post is nailed or screwed to the rafters. The boards that compose the partition, shown at C, are then nailed to the uprights. In one case the boarding comes on the right side of the joist, the inner surface of the topmost board coinciding with it. In the other case the boarding comes directly under the joist, the surfaces of the joist and boards to the right hand being coincident in one and the same plane. The method shown to the left is preferable. Each upright may be carried up to the top of the joist K, and fastened to it in the manner shown, and by giving partial support to the joist the floor of the loft will be proportionately strengthened. They may, however, be shortened and finished at the top from E to B with a ramp, as shown in Fig. 462. If each upright is carried up to the joist, the boarding should extend from F to B. The bottom of each upright should be set in a hole dug in the ground and filled up with brick rubbish, earth, etc., which must be well and tightly rammed together.

The manger.

802. With regard to the remainder of the fittings we will take those of the stall first, namely, the manger (O in Figs. 461, 462) and the rack (P in Fig. 462) for hay. Each of these will run across the head of the stall from one side to the other. The manger is merely a trough about 9 inches in depth and 12 inches wide, inside measurement from the outer surface of some boarding which should be fixed to the wall as a lining to the manger, forming, in point of fact, the inner side or back, so to speak, of the trough. The top of the front of the manger should be about 3 feet 6 inches above the ground or paving of the stall. A section of the manger, drawn on a scale of ¾ inch to 1 foot, is given in Fig. 466, which will show its construction clearly. In this A is the back wall of the building, B and C two boards 9 inches wide and 1 inch thick, fixed to wall to form back of manger; D a bracket-shaped slip, or even a piece of arris rail fixed to C, to carry the inner edge of E, the bottom of the manger; F a post, 3 inches by 2 inches, in the centre of the manger, and 6 inches from the wall, to give support and stability to the manger, and G a board nailed to

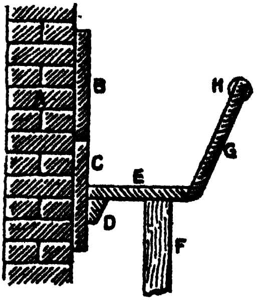


Fig. 466. Section of Manger.

the outer bevelled edge of E to form the outside of the manger. It is usual to surmount this by a circular capping, but the home carpenter may save himself the trouble of making and grooving such a capping by putting on two slips of wood, one on the outside and the other on the inside of G, as shown at H, and giving them a rounded form with the plane. Each end of the manger should be let into grooves, taken out to receive E and G, in two cheeks of wood, about 15 inches square and 1½ inches in thickness, one of which must be fixed at the proper height to the wall and the other to the partition that forms the side of the stall to the right

The rack for hay.

803. The next thing to be made will be the rack. To do this two pieces of wood, preferably of ash, or any hard wood should be taken, 3 inches in width and 2 inches thick. In these holes should be bored with 1¼-inch bit along the entire length of each, at intervals of about 3 inches between the holes, and connected by round bars of ash 2 feet 6 inches long at the utmost measuring from the outer surfaces of the bars or rails. The back of the rack may be formed of boards placed against the wall, similarly to the back of the manger, but there is no absolute necessity to do this. The bottom rail will just touch the wall or the backing, or boards, as the case may be, and the rack itself will be set at such an inclination to the wall that the top rail may project about from 15 to 18 inches from it. Its position is shown in Fig. 162, and its construction is so simple as to require no diagram. It is better to use ash for the rails, but if the home carpenter prefers to do so and save himself the trouble of getting out the bars, he may use mopsticks, whose utility, when rounded bars are wanted, has been frequently shown in previous parts of this volume. The ends of the rails may be dropped on to cleats notched to receive them and fastened to the wall on one side and to the wooden partition on the other. This done, the fittings of the stall are complete, with the exception of means for attaching the free ends of the head stall by which the horse is fastened up, if fastened up at all, either to the post F that supports the manger, or to a chain attached to the wall above the manger. The better way is to pass the free end of the head stall through a staple in F and then to a block of wood, which will prevent the withdrawal of the end through the staple by any action of the horse. When the horse is taken out of the stable, the head stall is simply removed and put into the manger, and another head stall on the bridle itself or part of the harness which serves as a head stall put on the horse. This completes the necessary fittings of the stall.

804. We must not forget, however, that if the stall is to be used as a

Door, paving and ventilation of stall.

loose box, a door about 5 feet in height must be attached to the framing of the entrance door in the manner already described to fill up the space C in Figs. 461 and 462. Ventilation, if the means for the escape of heated air by the openings above the rack and manhole are not considered sufficient, may be increased by the insertion of a 3-inch pipe in the wall just below the joist *a*, as shown at G in Fig. 461. This terminates outside the wall, in an elbow from which a pipe is carried upwards above the roof, as shown in Fig. 460. The floor of the stall should be made of paving bricks, sloping to a channel along the dotted line A B in Fig. 461, which should terminate at A in a drain, by which all drainage and water used from time to time in washing down the floor may be conveyed without the stable. The channel itself must, as a matter of course, slope from B to A to facilitate the escape of the water, etc.

Utilisation of remaining space in stable.

805. The space on the right-hand side of the stable, divided from the stall by the wooden partition already described, may be utilised in various ways. It affords access to the manhole, or trap-door, in the floor of the loft, indicated at M by transverse dotted lines from *e* to *f*, by means of steps, or a light ladder, shown at H. I should prefer a light ladder myself, because it can be removed at pleasure and laid along the foot of the partition, thus permitting access to the entire surface of the partition at any time, and enabling it to be used for the suspension of bridles, head stalls, and gear of this kind, which do not project far from the surface from hooks screwed to the partition for this purpose. The ladder need not be more than 12 inches in width at the utmost, including the spars used as sides, and when used it may be placed against the part of the manhole furthest from the partition, and not in close proximity to it or in the middle, as shown in the drawing. Against the wall brackets and hooks may be fixed for the carriage of saddles and the larger parts of the harness, and in the corner at N a circular or square corn-bin may be kept, in which oats for immediate use may be stored, and another may be placed close by it for chaff, etc. This part of the stable may be floored if the home carpenter likes, but it is better to pave it with brick like the other part of the stable, or with concrete, or even with pebbles. I do not recommend concrete for the flooring of the stable, unless it be grooved diagonally, to sough it, so to speak, for the horse to stand on and to prevent any chance of its slipping when going in or out. The diagonal grooving should be in short lengths so as to present a V form, thus VVVV, from side to side; but after all paving with paving bricks is far better. Pebbles for the flooring of a stable are most objectionable, because of the difficulty of removing the

ordure that gets through the straw and lodges in the depressions between the tops of the pebbles and the grouting that is worked in between them when the work of paving with them is completed. All the tools and implements used in the stable, such as brooms, pitchforks, etc , pails, and so forth, may be kept in this part, and brushes, curry-combs, horse-cloths, surcingles, etc., may be hung up against the walls or against the partitions.

Light ladder for stable use.

806. I have described elsewhere the method of making ladders of larger size and greater strength for outdoor use; the ladder for stable use and light work generally, that does not require to be of any great length, may be of far lighter build. It may vary in length from 10 to 15 feet, and 12 feet is a fair average length that would be useful in such a stable as I have been describing. A width of 12 inches, as I have already said, is sufficient, and this should be the width from side to side of spars, outside measurement, over all. The spars should be made of good sound white deal, if no ash is available, 2½ inches in width and 1⅝ in thickness, but these dimensions will be reduced when the spars are planed up; and, further, the edges or arrises should be well rounded off to afford a better grasp for the hands when going up the ladder or coming down. Having planed up the spars or sides, clamp them together in order to get the holes at regular and equal distances, and divide the length of the side into sixteen equal spaces of 9 inches each, as shown at A and B in Fig. 467, A showing the side of the side in plan, and B the two sides in front elevation when imposed one on the other and clamped together. When the work of division is complete, and the distances are marked, draw lines as shown by the dotted lines in the diagram on A and B, and carry them round each side, exposed ,to view as at A and the side opposite to it which is not shown in the diagram, and on the edges shown in B. Next draw, having bisected A at each end, a central line longitudinally along each spar, as shown by the long dotted line in A. Remove the clamps, and then with a ⅝-centre bit, or taper bit whose greatest expanse is ⅝ inch, bore holes through each side, as shown at A, in the direction of the dotted lines shown in B. Shape

Mode of making ladder.

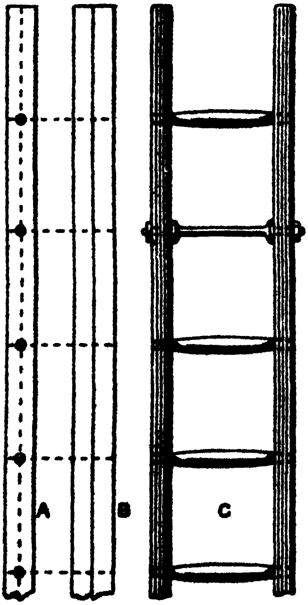


Fig. 467. Mode of making Light Ladder for Stable Use.

the staves of the ladder as shown in c, using oak or ash for this purpose. Make a saw kerf across the ends of each stave before inserting them, and when the whole of the fifteen staves have been put in position, and the parallelism of the sides ascertained, wedge them up. The width from inside of one side to inside of the other will be just about 9 inches when the sides have been planed up, and it will the better ensure parallelism and strengthen the ladder if the place of the second spoke from each end is occupied by an iron stave, with a shoulder on each side, measuring 9 inches in length from outer surface of one shoulder to outer surface of the other shoulder. The ends of each bar must be screw cut, and the bars held tightly in place by a nut turned tightly on to each screw-threaded end. It is as well for the amateur woodworker, if he have a greenhouse and other places in which light ladders are likely to be wanted, to have two, if not three, ranging from 10 feet to 14 or 15 feet in length. Round off the sharp edges of the spars before the ladder is put together, and when finished paint the sides of the ladder, but do not paint the spokes unless it be for about 2 inches inward from each side. Another good way of making this kind of ladder is to take a piece of wood, 4 inches in width by 2¼ inches in thickness, and, having marked out the divisions into 9-inch spaces for the spokes, to bore holes through the entire width for the staves, and then to divide the width longitudinally and rip the piece down for the two sides of the ladder. You will then get the staves at equal distances throughout the two sides, which will be in correspondence one with the other, and one boring operation with a twist bit will be sufficient for the stave holes in both sides.

Saddle-tree or bracket for saddle.

807. Hooks for hanging up harness and other purposes may be passed over without notice, so it is now necessary only to describe a saddle bracket to be fixed to the wall to receive any saddle when not in use. These may be bought in iron, but the home carpenter will prefer to make his in wood. The saddle-tree does not present any difficulty with regard to construction, as may be seen from Fig. 468. An ordinary bracket is first made; the back, which goes against the wall, and the strut, which enters and supports the horizontal bar at top, being made of stuff about 2 inches wide and 1 inch thick. This horizontal bar is made of a piece of

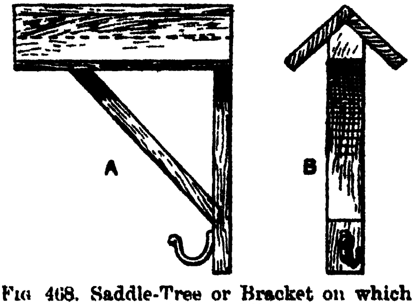


FIG. 468. Saddle-Tree or Bracket on which to place Saddle.

quartering, which is 2½ inches deep and 2 inches thick. The upper edges on each side are bevelled off, as shown, so as to form a right angle at the ridge. To do this the uppermost side, which is 2 inches wide, must be bisected longitudinally, and lines marked, one on each side, by means of the marking gauge, which must be set to 1 inch. This affords a resting-place and support for the two pieces of board which are nailed or screwed together at right angles and then screwed down to the bevelled top of the horizontal bar. In Fig. 468, A is the side elevation and B the front elevation. A hook may be screwed on to the lower end of the standard as shown. A very useful saddle-tree is exhibited in the illustration, better in every way than one of iron, whose sharp edges are likely to cut and wear the saddle where saddle and topmost bar come into contact, far more than the broad and sloping surfaces of the boards in Fig. 468, on which the saddle rests.

808. It will be convenient to place the corn-bin in the space on the right of the stable, and it may stand in the front right-hand corner of the stable, as shown in the plan in Fig. 460, in which a circular form has been given to it. It is better to make corn-bins rectangular in shape, because this form of box is possessed of greater capacity than a circular tub; but although the rectangular corn-bin is certainly more useful on account of the reason just stated, and also because it is capable of division into two and even three parts, if requisite, a circular corn bin is cheaper, because it may be made out of any cask or flour tub. It cannot, however, be easily divided into compartments; but it can be quickly made, because, in point of fact, it is only the cover to it that has to be made. No corn-bin should be without a cover, and that a cover that fits closely, to bar the entrance against rats and mice.

About corn-bins.

809. First, then, let us deal with the rectangular corn-bin, which may be made from 2 feet 6 inches to 3 feet in length, about 15 inches in width, and 2 feet 6 inches in height in front, and from 2 feet 9 inches to 3 feet in height behind. We will make ours of the smaller dimensions given, because it will be large enough, if, indeed, not too large, for the amateur woodworker who keeps a single horse or pony. The height in front and at back also includes the space under the corn-bin, for every corn-bin should be raised 6 inches above the surface of the ground or floor of stable to allow a free current of air to be constantly circulating under it, and to this end it may be raised on two sleepers, or pieces of joist, running from front to back at each end, or on four feet, or short legs, after the manner of chests of drawers. The "sleeper" form of support, however, is the best, because it is

Rectangular corn bin.

stronger and more stable, and the bottom of the bin may be screwed down to the sleepers.

Construction of corn bin.

810. The construction of the rectangular corn bin will be better understood from Fig 469, in which the corn bin is represented in isometrical perspective, showing the front, the side to the right and the top at one and the same view, without resorting to front elevation, end or side elevation and plan, which the home carpenter can easily put on paper for himself The drawing is made on a scale of ¾ inch to 1 foot, and the dimensions are taken at 2 feet 6 inches for length, 15 inches for width, 2 feet 6 inches measuring from the paved floor of stable in front, and 2 feet 9 inches behind The body of the corn bin is merely a large box of this form and these dimensions, made of boards 1 inch thick, the back and front being nailed to the sides or ends, and the bottom nailed to front, sides and back over all The front is sloped slightly after the manner of a cucumber frame, or garden frame—to speak generally, an escritoire or a bureau This is done in order to render it easier to get at the contents of the bin and to fill the measures, than it would be if the top of the bin was square and the bin itself of the same height all round. The position and thickness of the bottom is indicated by dotted lines, and the partition by which the bin is divided into two parts is shown by dotted lines also. The bin or box is affixed to two sleepers or joists, 15 inches in length, 8 inches wide, and 3 inches thick A width or depth of 6 inches is sufficient

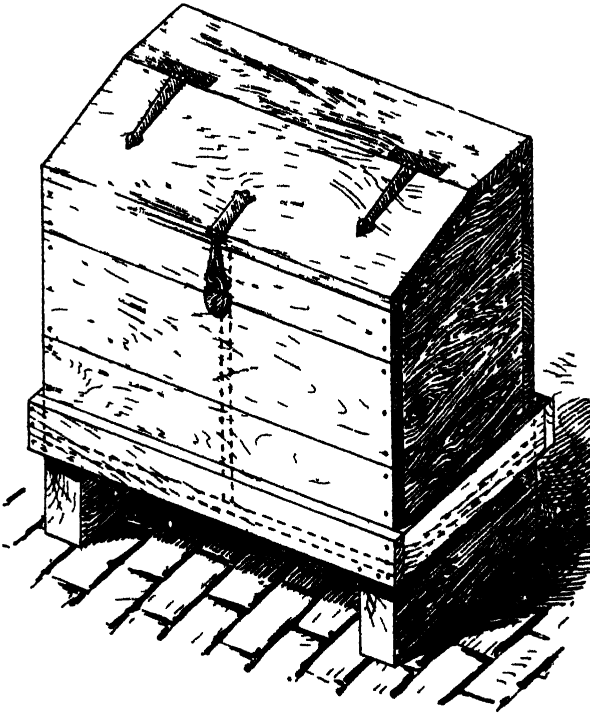


FIG 469 Rectangular Corn Bin in Isometrical Perspective

for the sleepers; a piece of skirting nailed round the bottom of the bin, 4 inches in width and 1 inch thick, and this laps over the sleepers to the depth of 1 inch. The flat part of the front may be nailed to the back and sides, and the partition in the interior may be fixed also. The free part of the cover or lid is attached to the fixed part by T or cross-garnet hinges. A swing hasp is attached to the front of the free part of the cover by means of an iron plate, to which the hasp is hinged, and the hasp fits over a staple through which the bow of a padlock is thrust.

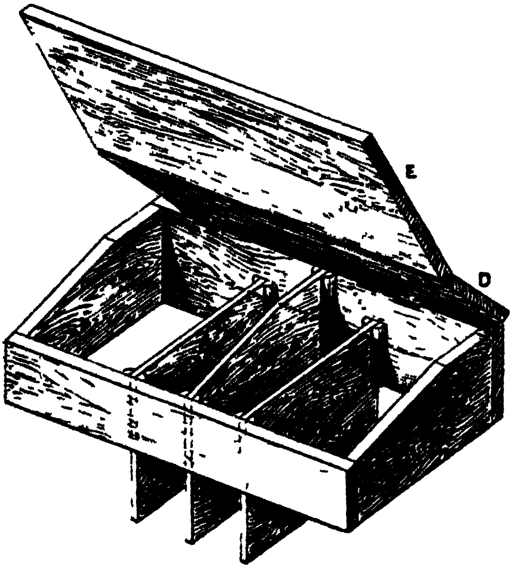


FIG. 170. Rectangular Corn-Bin, showing Method of putting in Partitions, and of making the Lid so as to wholly uncover Contents of Box.

Free and movable partitions

811. If the corn-bin be divided into two compartments, and there is no desire on the part of the maker and owner to have more, the partition may be fixed, and the flat part of the cover fixed also, as already suggested. To make two compartments only, the central partition is placed as shown at A, and it is carried up to the top, being shaped like the ends or sides. It is better, however, to make this and all divisions movable, and of thin wood, certainly not more than from ¼ inch to ½ inch in thickness when planed up. To do this, small fillets should be nailed in the proper position, and at proper distances, to the front and back of the bin, so as to form grooves in which the boards that form the partition may be moved up and down, and rendered capable of insertion or removal at pleasure. In this case the top of the central partition may be formed like the sides, as drawn, or terminate in a square head, as shown by the dotted line in A, or as drawn in the partitions B and C. By having three sets of fillets it is possible to divide the interior of the bin into two compartments by the partition A, or into three by inserting the partitions B and C; or by the withdrawal of these the corn-bin may be used for one kind of food only. In Fig. 470, which is also drawn on a scale of ¾ inch to 1 foot, I have shown the top part only, the lower part below the

topmost board being entirely removed. I have, however, brought the partitions lower than this, so that the home carpenter may better understand their construction and the mode of fixing them. The partitions should not be made in one piece, but of separate pieces of board that may be put in one on top of the other. The boards of each partition should be lettered in pencil, say as A, B, and C, and the boards of each partition should be numbered 1, 2, 3, etc.—beginning with the lowest piece as 1, and proceeding in order consecutively up to the top—thus, on replacement after temporary withdrawal, every partition will be arranged in the same order as it was when the boards of which it is composed were first made and put in.

Free top or cover to bin.

812. Let me now call the attention of the home carpenter to the top, lid, or cover of the rectangular corn-bin. If the partitions—whether there be only one, as at A, for division of the bin into two parts, or two, as at B and C, for division into three parts—be fixed and immovable, it is as well, if not better, to have the flat part of the lid, shown at D in Fig. 470, fixed down to the flat and horizontal part of the top edge of the sides, as it appears in Fig. 469. If, however, the home carpenter wishes to shift the partitions, or withdraw them in part, or altogether, it will be better for convenience of insertion and easy withdrawal of the partitions, to have both parts of the lid free to lift up, as shown in Fig. 470. In order to manage this, D is hinged to the back with solid butt hinges, the flaps of which are let into the top edge of the back and the under surface of D; or, instead of butt hinges, box hinges may be used, which are equally serviceable, and, perhaps, better for the purpose in view. The principle of the box hinge is shown in Fig. 471, in which the upper tongue is screwed to the under side of the flat part, D, of the lid, and the lower tongue to the inner surface of the back; this lower part of the hinge being bent at right angles, so that the shorter part is let into the topmost edge of the back, and the tongue passes vertically down its inner and vertical surface, as shown in the illustration. The slanting part of the lid, E, is attached to the flat part of the lid, D, by T or cross-garnet hinges, put on as shown already in Fig. 469. In connecting the flat and sloping parts of the lid, it is necessary to bevel the inner edge of the slanting part slightly to prevent any chance of "binding," as it is termed, by pressing too tightly along the lower edge against the edge of the flat part D. This done, the rectangular corn-bin is complete. It may be painted outside with three good coats of paint, or stained and varnished, as the home carpenter may prefer. It should

Principle of box hinges.

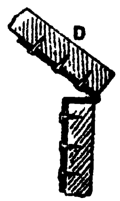


FIG. 471. Principle of Box Hinges.

not be painted on the inner surface, which should, however, be planed up and not left rough, as rough work often serves as a lurking place for small insects. The outer surface must, of course, be planed up to render it smooth for painting.

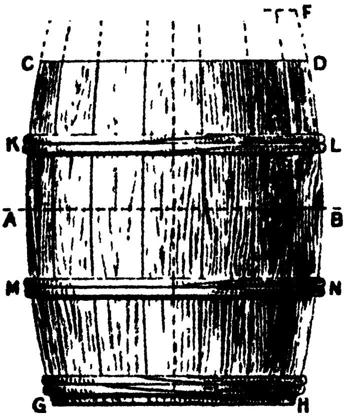


Fig. 472. Treatment of Cask for Conversion into Circular Corn-Bin.

Circular bin for corn, etc.

Shortening cask.

813. Suppose, however, that the home carpenter is straitened in the way of time, and, moreover, does not wish to incur the expense and undergo the labour and manual toil that is involved in the construction of a rectangular corn-bin, and wishes to turn out something cheaper that will answer the purpose very nearly as well, although it may not be so convenient; he must obtain from the grocer's or miller's just such a cask as is represented in elevation in Fig. 472, and is drawn on a scale of ¼ inch to 1 foot. Casks of this description vary very much in size, but we will suppose ours to be 2 feet 8 inches in height, outside measurement, from the ground; 2 feet in diameter at its central and greatest width, namely, the dotted line A B, and 1 foot 9 inches in diameter across each end, namely, at E F and G H. The cask is hooped at each end and at K L, M N, at equal distances of about 10 inches from each end, at K L, M N. The head, which was originally at E F, has been removed, and, when we look into the cask, the first thought is that it is rather too deep for the purpose in view, and scarcely wide enough across at E F, whence the top has been removed. It is easy, however, to overcome these objections by drawing a line, C D, at 4 inches' distance from the edge of the top and about 6 inches above the topmost line of hoops at K L, and running a saw-cut round the cask, care must be taken to see that no nails are in the way to damage the teeth of the saw. The saw-cut is soon made, and the tops of the staves between E F and C D soon fall away, hoops and all. It is somewhat surprising to see how the cask is dwarfed by this operation, as the reader may see, even in the diagram itself, by hiding the part above C D with a slip of paper. It does not appear nearly so deep now, and the opening across C D is wider, the diameter being very nearly, if not quite, 1 foot 11 inches. We may take it that it is so. The great object now is to make a lid or cover, and, as we cannot very well hoop the cask at, or rather below, C D, to hit on some plan

which will at once serve as a sufficient and efficient substitute for hooping, and secure and strengthen the ends of the staves by connecting them, and also afford a sound and solid foundation for the lid that is to be put to it. Division into compartments is not to be thought of—the circular form of the cask does not easily lend itself to any arrangement of this kind.

Substitute for hooping to cask.

814. Such a substitute for hooping, which may be alike serviceable and desirable, must be found, either in placing some pieces of wood round the interior of the cask, or in doing precisely the same thing round the exterior. The first mode will tend to diminish the diameter of the interior of the cask at the opening, and, therefore, may be dismissed at once. The second, however, can in no way tend to do this, and we will, therefore, adopt this plan. The staves of a cask vary from ¾ inch to ¼ inch, and even more in thickness; but ½ inch is, I think, as far as my experience goes, the average thickness. There is no absolute regularity in them, and they do not form a perfect circle, as shown in Fig. 473, nor are they of equal width, as assumed in the diagram. We want, however, to get our work as accurately fitted as possible, and so we must proceed in this way. Cut saw kerfs at A, B, C, D, so that the lines or cords that are stretched from A to B and from C to D cross at right angles at E. Cut four rectangular pieces of board, or, at all events, four pieces of board such as F, G, E, H, rectangular at E, and cut each piece in such a manner that they may be notched into each other at G, H, K, I, as shown in the illustration.

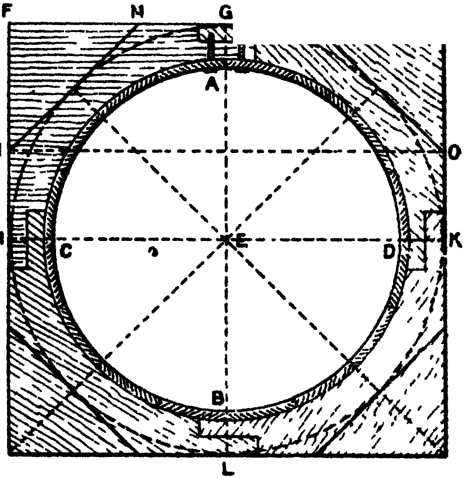


FIG. 473. Mode of Connecting Staves of Cask and forming Basis for Lid

815. To do this, cut each board accurately to the angle and extent A E C, and then let the ends or horns project beyond G A, K D, L B, and H C. Then lay the board F G E H on the top of the cask so that the sides A E, E C coincide exactly with the cords already mentioned, and with a pencil mark the outline of the edge of the cask on the under surface of the wood. Cut out the part between the angle A E C and the arc A C to the extent marked on the board, which will coincide with the *outer* edge of the cask. Bevel very slightly to make the

wood fit as closely as may be to the staves, and halve the horns at each end in the manner shown. Do this with the remaining three pieces of wood, and cut the horns as accurately as possible, so that the laps may fit well together. The stuff used should not by any means be less than 1 inch in thickness, even when planed up, and it would be better if it were 1¼ or even 1½ inches in thickness. Having done this take the piece first cut, butt it closely to the staves, and screw the staves to it from the inside of the cask—two screws to each stave. The best to use will be No. 7 or No. 8 of Nettlefold's patent wood screws, 2 inches in length, which will be found to be a fairly fine screw; but do not screw up into either lap at horns until the lap of the adjacent horn of the next piece has been accurately and closely fitted. Proceed in the same manner with the next piece, say the piece between G and K, and then put screws through stave and laps, as shown at G, bringing them all together as closely and tightly as possible. Proceed in the same manner all round the cask, screwing the staves firmly to each piece of wood and to the laps also when they occur.

Construction of wooden framing round top of cask.

816. The framing is now practically complete, and may be left in its square form if the home carpenter wishes to do so; but to my mind it will have too heavy an appearance. The only plea that can be urged in favour of its adoption is, that when the lid is put on the square top will form a square table, so to speak. It would look better if the corners were cut away, as at F M N, so as to give the top an octagonal shape. If, however, the home carpenter wishes to make the top circular and the framing circular, so as to be more in conformity with the shape of the cask, all he has to do is to round off the framing, as shown by the dotted line, or rather circle, G K L H. It is quicker to take off, first, the four main corners and form the octagon; and then to take off corner after corner with the tenon saw until the outline has been brought nearly to the form of a circle, when the work can be completed and the circular form attained by aid of the wood rasp. The compass saw, though it is absolutely necessary for circular work on the inside, that is to say, cutting out a round or an oval hole of any size, is by no means needful for the production of curves on the outside of any work.

Cover to circular corn bin.

817. It now only remains to make the lid or cover, and this is quickly done. Supposing the octagonal form to be taken, select a fitting piece of wood about ⅞ or 1 inch in thickness, plane up the front edge truly, and put it on the framing already made, bringing the trued edge to coincide with the dotted line N O in Fig. 473. Screw this down firmly to the framing N G O, as shown by the screw heads appearing in the part A of

Making lid or cover to circular bin.

cover in Fig. 474. When this has been done, join together with dowels, or a tongue and groove joint, as the amateur wood worker may prefer and his skill serve; and, having trued up the outer edge of the middle piece B, fit the whole to A, hanging the jointed and movable part of the lid to the immovable part A, with T or cross-garnet hinges, as shown. Of course, the boards should be cut to shape before they are put on and connected by hinges. Take off the sharp edge all round the cover with a small plane, giving it a rounded form. Then cut a hole at D for a staple to come through, and fasten down the lid with a stick thrust into the loop of the staple, or preferably with a padlock. The circular corn-bin is now complete and ready for use.

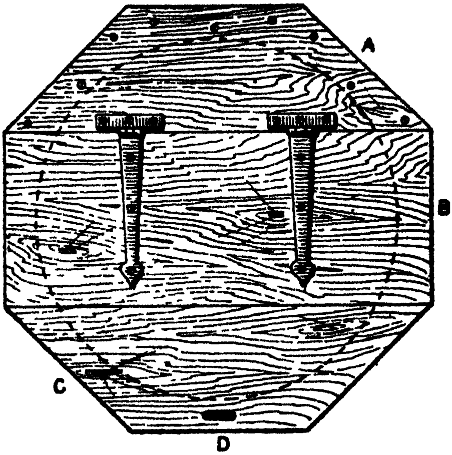


Fig. 474. Octagonal Lid or Cover to Bin

818. If there be any desire to render the corn-bin dust proof, as far as it is possible to do so, screw to the inside of the cover two pieces of wood, cut in such a manner that they will fit with tolerable closeness *inside* the cask at the top, going into it in the manner shown in Fig. 475, in section, in which A is the outer part of lid, B the inner part screwed on to A, C C′ staves of cask, and D D′ parts of framing. The section is taken across the centre of the lid, just where the framing is narrowest. This method may be followed in making any hinged cover or lid dust-proof.

How to render lid dust-proof.

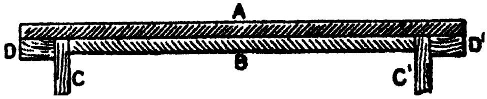


Fig. 475. Mode of Rendering Lid Dust-proof

819. Pails will be needed in the stable for giving the horse water, and other purposes. I have already gone into the matter of utilising lard pails. Of course, they are not as strong as the zinc or galvanised iron pails that are now generally used. When the wooden pails are used for horses or large animals of any kind, they should be furnished with handles of iron hooked into iron eyes, or loops, fastened to the sides of the cask. They may be bought at the ironmonger's, or, at all events, at the marine store dealer's.

Stable pails.

820. Damage that is not very extensive and not very harmful to the

structure, such as the gnawing of the edge of any woodwork by horse or dog, may often be repaired, as far as hiding the damage from view goes, by pieces of zinc or tinned plate nailed over the part affected with flat-headed tinned tacks, or short but strong wire nails. The metal must, of course, be moulded or shaped to form required. My meaning will be clear on reference to Fig. 476, in which a post is shown at A, whose arris or edge has been damaged and partly carried away by gnawing or kicking. To hide this a piece of tinned plate, shaped as shown at B, is placed over the damaged parts, as shown in sketch of post at C, after repairs have been effected.

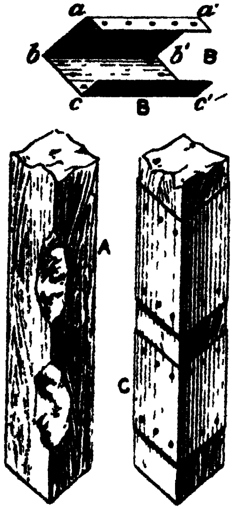


Fig. 476. Repair of Damage to Arris of Post by Tinned Plate.

Repair by tinned plate.

Tinned plate, how obtained and how shaped.

821. The tinned plate may be obtained from meat tins, coffee tins, etc., taken to pieces by placing them on a hot stove, which causes the solder to melt, and the plate thus unfastened may be easily bent or hammered with a wooden mallet until it is perfectly flat, and the curved shape it formerly had utterly obliterated. It is then cut to the length and breadth required, after the dimensions for its new purpose have been marked out with rule and reamer, by means of a pair of tinman's shears or snips, or even an old but strong pair of scissors, and it is bent by first striking it along the line, made with the reamer on the side that is to be the inside of the plate when fixed, with a blunt tool, such as an old chisel, or a broad but short turnscrew, struck with a wooden mallet, and then brought to the rectangular form by applying the lines thus formed and shown in B by *a a'*, *b b'*, *c c'*, to the edge of a rectangular bar of wood, and beating the plate with a mallet until it has assumed its new form. Holes are then made, as shown in B, by a sharp-pointed tool, for the easy entrance of the nails that are used to fasten it to the post. The object in bending the ends of the plate is to prevent the occurrence of any sharp edge of the plate itself, or the possibility of any of its corners being bent up on the sides of the post where the damage has been done, otherwise it would have been sufficient to cut the plate just a little larger than the size actually required to hide the damage.

822. It is unnecessary to shew here how birch brooms are made. Another kind of broom excellent for stable use is the bass broom. Bass, or bast, as it is indifferently called, is properly applied to the inner bark of

Bass brooms.

Construction of bass broom.

the linden or lime tree, which is used for making matting, used much by gardeners in the mat form for covering up plants when sent out, and also when taken from the mat, and in its original form of long strips as first stripped from the tree, for tying up plants. It is not so much used now for this purpose, as a stronger and more enduring substitute for it is found in raffia. The bass broom is made of a dried rush or wiry grass-like plant; but I fear the home carpenter will find it difficult to procure, as the material is so quickly bought up by the trade. The mode of making bass brooms is shown in Fig. 477, in which A affords a view of the top of the piece of wood in which the knots or bunches of the material is inserted, with a hole bored therein in a slanting direction for the insertion of the handle; B, a view of the bottom of the wood bored with four rows, each containing fourteen holes, for the insertion of the knots; and C, the section of the wooden top across the handle, or rather the hole made for the reception of the handle. There is no difficulty in making brooms of this kind if the material can be obtained, but it is by no means an attractive employment. The form of the wooden top will be easily recognised and understood by the home carpenter. It is, or may be, made 12 inches in length, and about 4 inches in width. The block of wood from which the top is made may be from 2½ to 3 inches in thickness. The edges of the upper part of the wood, as shown at A, until it assumes the nearly semicircular form, are shown in the section at C. If the wood be 3 inches in thickness, the semicircular form will commence at 1 inch from or above the flat bottom, seeing that the width is 4 inches and that the radius for the semicircular shaping must therefore be 2 inches. The hole for the handle is made in a slanting direction, rather on one side of the central line of bisection, lengthways along the top. The proper slope may be ascertained by examination of any sweeping broom. The bottom of the broom-stock, so to speak, is shown in plan at B, and in this four rows, each containing fourteen holes, are bored at regular intervals with a ½-inch centre-bit. Each knot of bass contains as much material as can be thrust into each hole. As each short row is completed the knot is fixed in the socket by pouring hot pitch into the hole, which penetrates between the fibres of the material and keeps every fibre tightly fixed when the pitch is set and cold, and it sets and hardens very rapidly.

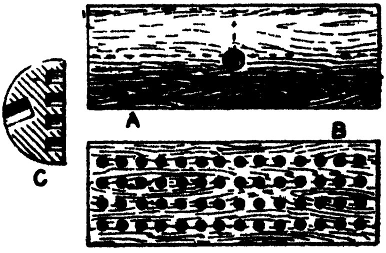


FIG. 477. Wooden Top of Bass Broom.

The squeegee.

Construction of squeegee.

823. Another appliance of great use in clearing moisture off floors of paving stone, brick, and concrete, after they have been washed down, is the squeegee, which is illustrated in plan as seen from above at A, in plan as seen from below at B, and in section across the handle at C. In each component part of Fig. 478, W represents the wooden part of the squeegee, and L the rubber or leather which is fixed to the wood. Of course, vulcanised india-rubber, ¼ inch in thickness, is the best kind of material to be employed in making the squeegee, and it can be easily procured from any maker of vulcanised indiarubber goods. If, however, it cannot be got, a piece of leather may be used, but the leather is by no means so good or fit for the purpose as the rubber, because the latter, by virtue of its elasticity, adapts itself far more readily to any unevenness of surface, and thus touching every part of the paving over which it is passed, clears off the moisture in a surprising manner, leaving the paving perfectly clean and almost dry. In order to make a squeegee, a piece of wood is taken, say 12 inches in length, 3 inches in width, or a little more, and from 2 to 2½ inches in thickness. This is rounded off, as shown in Fig. 478, in the plan as seen from the top at A, and as indicated in section across the handle at C. A hole for the handle is made in the same manner as that adopted for the insertion of the handle of the bass broom; but here all similarity ends. Turning to the bottom of the stock, as shown in plan as seen from below at B, and also looking at the section, we see that a rebate is made along the edge towards which the handle slants, to the depth of the thickness of the rubber or leather and in width about one-third the width of the bottom, that is to say, just 1 inch. If the rubber is ¼ inch in thickness, the rebate must be ¼ inch deep. A piece of rubber 12 inches long, and about 2½ inches in width, is then laid in the rebate, and fastened down to the wood. The rubber, or leather, whichever may be used, projects for about 1½ inches beyond the wood, and clearance of all dirt and moisture is effected by pushing the appliance along the paving so that the edge of the rubber comes in direct contact with it and passes over it, carrying everything before it.

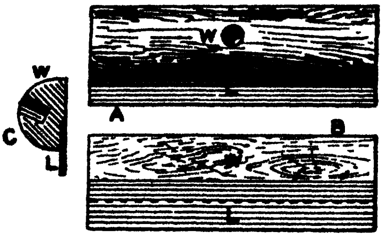


FIG. 478 Mode of making Squeegee.

824. I think that I have now said everything that I can well say with respect to the fittings and appliances that the home carpenter can make for the stable, without going to the expense, labour and trouble of building a stable

entirely. I have refrained from dealing with forms of buildings suitable for stables other than that which I have described because I shall touch on this to a limited extent in the next chapter in suggestions for a stable, cowshed or linhay and small coach-house, combined under one roof. It is always a difficult task, as I have frequently said, to write on supposition; but the home carpenter will always be able to mould and apply the instructions given on this basis to his own requirements and circumstances of space, place and construction, and be able to manage nearly as well as if they were specially written to meet his own individual case.

Other forms of Stables.

825. I must not forget that there will be many amateur woodworkers who, although they have the will and are possessed of all the skill necessary to make things of all kinds for themselves, will not be able to spare the time to accomplish everything they wish to do, and make with their own hands everything they wish to have. I must not, therefore, omit to call the attention of the reader to the iron fittings for stables made and supplied by the Jersey Company, Limited: sizes and prices can be learnt from the catalogue and price list sent by the company to any applicant, and from which the illustrations given here are taken. First in order is their corner water trough, which is so made as to be fixed in any corner of the stall. Being a fixture, it is far more handy than leaving water in a bucket on the floor of the stall, for this the animal may accidentally overturn at any time, and its contents will be lost. This, however, cannot possibly be done with the corner water trough, and hence its great utility.

Jersey Company's stall water trough.

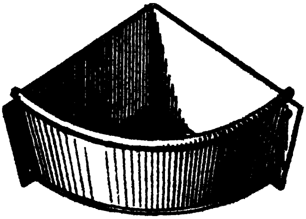


FIG. 479. Corner Water Trough.

826. But the handy corner water trough is not the only thing that the Jersey Company supply in galvanised iron, for they manufacture and send out mangers as well, made of the same material and equally convenient and desirable. Fig. 480 will give the reader a good idea of their corner manger. If I were building a stable to-morrow I should certainly use these appliances, instead of having mangers made of wood, and I should have them because they can be purchased at a cheaper rate than the wooden ones can be made by any carpenter, whether home or professional, and they can be more easily kept clean and in a fresh and sweet condition. And not only is there a form of corner manger which can be quickly put in place, and is easily fixed, but there is also a portable iron galvanised manger of a good size, whose great advantage is that it can be used in a

Corner galvanised iron manger.

Portable manger.

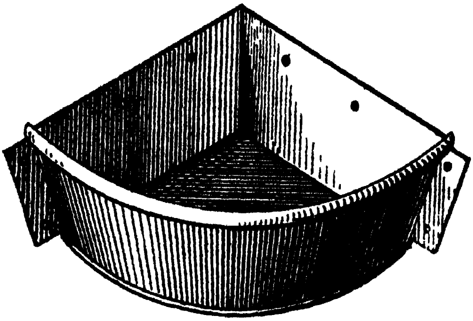


Fig. 480. Corner Galvanised Iron Manger

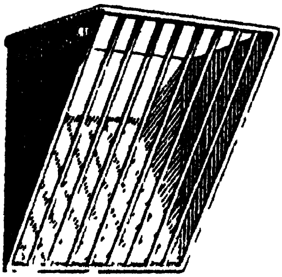


Fig. 481. Galvanised Portable Hay Rack.

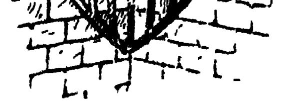


Fig. 482. Galvanised Wrought Iron Corner Hay Rack.

Galvanised iron hay racks.

stall in the same manner as any ordinary manger, and, to use the company's own words, "can be hung on any gate, hurdle, or rail, or can be tied to a tree, post, cart, etc." The means of attachment are not visible in the illustration, but it is to be inferred that this is managed by hooks or holes. Lastly, the company make and supply two forms of hay racks, also made of galvanised iron, which are illustrated in Figs. 481, 482. In the first kind, which is portable, and whose shape and form of construction is shown in Fig. 481, its advantages are twofold, for it can be suspended from, or fixed to, the wall of the stable in the same manner as the ordinary wooden hay rack, and in the same position, or, like the portable manger mentioned above, can be hung on or tied to any of the things particularised above. This is known as the "Galvanised portable hay rack;" the other, which is a fixture in the corner, like the corner manger and water trough, is known as the "galvanised wrought iron corner hay rack," and from its name we are made aware of the nature of its material. Three of these, namely, those illustrated in Figs. 479, 480, and 482, appear to be made in one size only, but the other two are made—the portable manger in four and the portable hay rack in three sizes—so that intending purchasers may easily determine for themselves which size and which pattern of those which are represented will best meet their requirements.

CHAPTER VI.

THE COW: ITS LODGEMENTS, AND FEEDING, AND OTHER APPLIANCES, WITHIN AND WITHOUT THE SHED.

The Cowhouse and its Fittings, Appliances, etc.—Right and Wrong Ways of making Three-legged Stools—Why Right and why Wrong—Cattle Crib—Corner Posts and Sides of Crib—Bottom and Braces of Crib—Cattle Trough—Cattle Rack—Dimensions—Construction—Putting Front, Back, Ends, and Bottom together—Cover, or Lid—Construction of Stand for Cattle Rack—The Legs of the Stand, and the Rails that connect them—Bars across Lower Rails, and Connection of Rack and Stand—Root-cutter for Slicing Turnips, etc.—Construction of Stool—Knife for Root-Cutter—Slide for Root-Cutter—Formation of Slide for Cutter—Formation of Groove for Slide in Root-Cutter—Marking out and Cutting Grooves—Formation of Groove by Amateur Carpenter—Notes on Cowhouses in Holland—Chief Requisites in a Cowhouse—Plan of Interior of Cowhouse—Partitions in Cowhouse—Division of Manger—Bars and Gates across Passage Ways in Stables—Gates as Barrier across Pathway—Loft in Lean-to Cowhouse—Construction of Loft—Mode of fitting Front with Open Gates and Close Doors—Posts to support Wallplate—Placing New Posts in Position—Shoring up Wallplate—Completion of the Fixing of the New Posts—Size of Gates, etc.—Composite Building, comprising Cowhouse, Stable, and Coach-house—The Cowhouse—The Stable—The Coach-house—Roof of Corrugated Iron—Roof of Threefold Building—Hip in Roof—Valleys in Roof—Cutting Corrugated Iron—Slope of Roofs—Construction of Iron Roof—The Wallplates, Rafters, and Purlins—Effect of Notching in Carpentry and Joinery—Timbers to strengthen Roof—Corrugated Iron Plates for Roof and Roof-ridge—The Louvre—Construction and Determination of Dimensions—Skeleton Frame of Louvre—Louvre Boards—External Staircase—Variation in Form—Dimensions of Materials for External Staircase—Inclination or Slope of Steps and Stairs—Dimensions of Staircase—Construction of Staircase—Butter Boxes—How to Fasten Lid—Butter Prints—Mode of Making Butter Prints in Plain Wood—Mode of Cutting Prints—Appliances for Sheep—Means and Mode of Tethering Goat.

The cowhouse and its fittings, appliances, etc.

827. THE cowshed, cow-linhay, or cow-lodge, as it is variously styled in different parts of England, or the byre, as the cowhouse is called in Scotland, does not at first sight appear to be a subject on which there is much to say; but, in addition to what may be advanced, and advanced with profit, with respect to its internal fittings, which are rough and ready at the best, and external appliances, I intend to use it as a peg whereon to hang suggestions for a composite building, partly stable, partly coach-house, and partly cowhouse, which, I think, would be well worth the notice of any one who has to put up a building of this kind, either at home or abroad in the colonies. As to the fittings of the cow-house internally, we

have merely to deal with the rough partitions by which the house itself is divided into separate stalls, or compartments, for individual cows; the racks which take the place of mangers and hay racks in the stable, and the means of securing each cow in its own stall if this be deemed needful. A loft is as desirable for a cowhouse as for a stable, but there is by no means so much care required in its construction. As to fittings and appliances of a movable character, it may be needful to some to say a few words about the milking-stool, and a knife and bench, or stool, for the purpose of cutting Swede turnips and mangold, or mangel wurzel, into slices for winter feeding. The cattle crib and feeding trough must not be passed over without notice. The milk-yoke, which is placed over the shoulders to render the carrying of two pails filled with milk, an easier task, must be passed over without further allusion, for I am pretty sure it would be beyond the skill of most home carpenters to cut out of the solid. Not so, however, with butter prints and butter boxes for transmission of butter, made-up in pounds, from place to place, although butter moulds, like milk yokes, are not so easily made. The home carpenter can contribute nothing to dairy appliances beyond these.

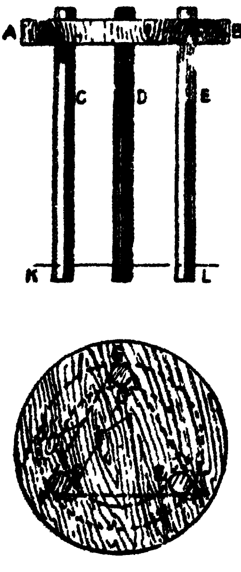


Fig. 483. Wrong Way of making Three-legged Stool.

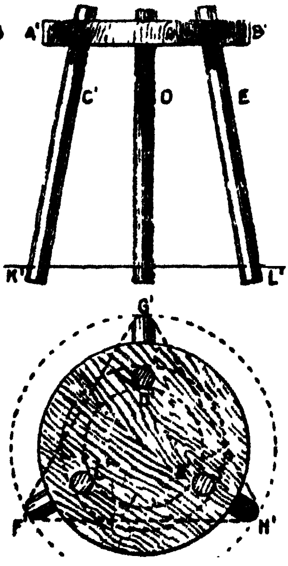


Fig. 484. Right Way of making Three-legged Stool.

828. Let us deal with all the minor matters in detail first of all, and leave the composite building until the last.

Right and wrong ways of making three-legged stools.

829. The wrong way of making a milking stool is exemplified in Fig. 483, in elevation above, and in plan, as seen from above, below. The right way is shown in the same manner in Fig. 484, and in each diagram the same letters have been used, but the letters in Fig. 484 are distinguished from those in Fig. 483 by a dash or accent mark.

830. The wrong way consists in putting in the legs vertically, the result of making the holes in the seat for the legs C, D, E vertical, instead of in a

slanting direction, as C′, D′, E′, in Fig. 484, which shows the right way. Of course, the position of the legs depends entirely on the way in which the holes or sockets, made to receive the upper ends of the legs, are made; and the greater the degree of slope that is given to the hole, the more slanting the legs will be, and if this be done in moderation, and at the angle shown by the elevation in Fig. 484. A B in Fig. 483 and A′ B′ in Fig. 484 show the seat, which is about 9 inches in diameter in each case. Now, in A B vertical holes have been bored to receive the legs, which are made of rounded pieces, about 1 inch or 1¼ inches in diameter; the holes for C, D, E are vertical, and the area or ring on which they stand is shown by dotted lines. The consequence of this is, that in looking at the plan the foot or lower end of each leg is directly under the top; but in Fig. 484, looking down on the stool from above, the ends of the legs C′, D′, E′ extend outwards beyond the edge of the seat, and assume the positions shown at F′, G′, H′. What is the effect of this? Why, the area of support in Fig. 484 is very much larger than in Fig. 483. This is shown by comparison of the circle F, G, H in the latter with the circle F′, G′, H′ in the former, and, to put it in the form of inverse ratio of proportion, as the area of the circle F, G, H is to the area of the circle F′, G′, H′, so is the liability of the stool standing on the area F′, G′, H′ to be tipped over to that of the stool standing on the area F, G, H, the liability of the stool on the smaller area being far greater than that of the stool on the larger area. I must, however, point out that the areas of support over which the stools are respectively spread, are denoted by the triangles F, G, H, F′, G′, H′, rather than by the circles, for it is the triangle in each case that denotes the area of support. The weights of the two stools are the same, the same amount and quantity of wood being used in the construction of each stool, approximately speaking; but it is evident that far less power will have to be applied to the edge of the stool standing on the smaller area to tip it over, than must be applied to the edge of the stool standing on the larger area to produce the same result. The seat of the stool is about 9 inches in diameter, and from 1¼ to 1½ in thickness; the legs are 10 inches in length, including the portion that passes through the seat. A bit of elm, oak, or beech is best for the seat, the legs may be made of oak, or any hard wood, and should be somewhat larger in diameter towards the bottom of the leg. A saw cut should be made in the upper end of each leg, so that it may be wedged up and tightly held in the hole by this means. The ends of the legs should then be cut off level with the upper surface of the seat, and the legs should be cut to the proper length, and, in Fig. 484, to the proper level along the lines K L, K′ L′. Those

Why right and why wrong.

who make a stool for milking purposes, in the manner shown in Fig. 484, and of the materials indicated, will be possessed of an article that will bear any amount of rough usage without coming to grief.

831. The next thing to which we may turn our attention is a crib or manger for cattle, which may be placed in any yard for winter feeding, or in the field, as may be necessary. An illustration of a wooden crib well suited for the purpose in view is given in Fig. 485, which is so drawn in isometrical perspective as to convey, by means of illustration, the best idea possible of its construction to the home carpenter. Cribs of this kind are square in form, and are usually made, as far as dimensions are concerned, from 4 to 5 feet square. This relates to the body of the crib, if I may call it so; but the measurement of other parts have yet to be given in detail, and I will now proceed to do this and to describe its construction, premising that the illustration itself is on the scale of ¾ inch to 1 foot, and that it represents **Cattle crib.** a crib 4 feet square. The first thing to be done is to cut four corner posts of stuff 4 inches square, and to cut these 4 feet 6 inches in length. Mark these posts all round with the square and pencil at the height of 1 foot 9 inches from the ground, and again at the height of 2 feet 9 inches from the ground, leaving a space of 12 inches between the two markings. Then, having set the marking gauge to 1 inch, mark each post vertically on the outer corner, and on the two adjacent corners, to the depth of 1 inch, and remove

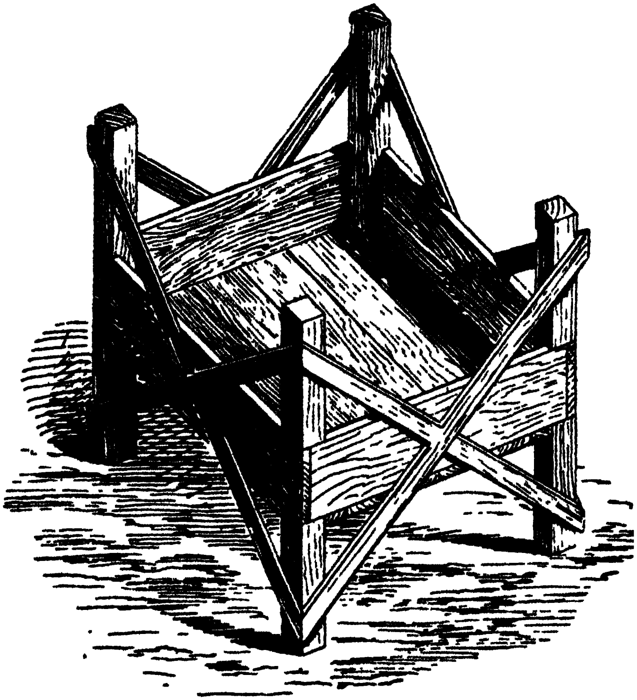


FIG. 485. Cattle Crib for Feeding Cows in Yard or Field.

Corner posts and sides of crib.

the wood on each of the *outer* sides of the posts to this depth, to admit of the insertion all round of boards 1 inch in thickness, 12 inches in width, and 4 feet in length for two of the boards, and 3 feet 10 inches for the other two. This difference in length is made so that—as shown in the illustration—the sides of the crib on two opposite sides may drop in between the ends of the sides forming the other pair of opposite sides, and thus leave their outer surfaces flush with the outer faces of the posts. If the home carpenter judge it better to make the sides of thicker stuff, say of the thickness of 1¼ or 1½ inches, the boards should be, so to speak, halved into the posts to the extent of ¼ inch in one case and ½ inch in the other, thus keeping the thickness of the sides in the part let into the posts to 1 inch, because it is not desirable to weaken the posts themselves by a greater reduction.

Bottom and braces of crib.

832. The carcase of the crib, made thus far, is then turned upside down, and boards from 1 inch to 1¼ inches are then nailed on to form the bottom of the crib. These boards should be dowelled together with pegs or stout wire nails. Practically, when the boards forming the bottom have been put together and firmly nailed on, the crib is complete, as far as containing purposes go; and the only thing that need be said further about the carcase of the crib is, that instead of making the bottom solid, as described, the home carpenter may, if he thinks it better to do so, make the bottom open, for the sake of letting any rain that may fall escape as quickly as possible, thus preventing any fodder that may be put therein from getting sodden with rain water that cannot get away, and permitting the air to pass freely through it. Such an open bottom is made by nailing on strips of board about 4 inches in width, from side to side, leaving an interval of 1 inch between them. Lastly, diagonal braces, halved together in the centre, in the manner shown in the illustration, should be nailed to the posts and sides: the halving in this manner, in the form of a St. Andrew's Cross, brings the inner surface of the bracing flush with the outer surface of the posts and sides. It answers a double purpose; for, in the first place, the bracing strengthens and stiffens the structure, and, in the next place, it prevents more than one cow or one bullock, as the case may be, feeding at each side at one and the same time, and thus prevents any accident that might happen from the jostling of heavy and horned beasts in close proximity.

Cattle trough.

833. The form of troughs has been so frequently touched on in this volume, especially in the description of things of this kind for pigs and rabbits, that it is unnecessary to say much more about it. With regard

to dimensions, they should not be less than 4 feet in length, but, if necessary, they may be made twice as long as this, or of any length between these extremes. They should be about 18 inches in width, from edge to edge of side, and from 12 to 15 inches in depth. If intended merely to hold roots, etc., when sliced up by means of the root-cutter, which will be described presently, the edges of sides and bottom need only be nailed together in the ordinary way, but if intended to hold water for watering cattle, the parts that are brought into immediate contact should be freely dressed with thick paint, and the joints afterwards smeared along the line of junction with white or red lead. As a substitute for this, pitch may be used, which must be melted in a ladle and run along the line of junction when hot. It is desirable that all wooden articles that are exposed to the action of the weather should be well painted on the exterior, or dressed with Stockholm tar. It is better to put roots, after they have been sliced up by the root-cutter, in vessels of this description; for far less waste is incurred when the roots, whether mangold wurzel or Swede turnips, are given in this manner.

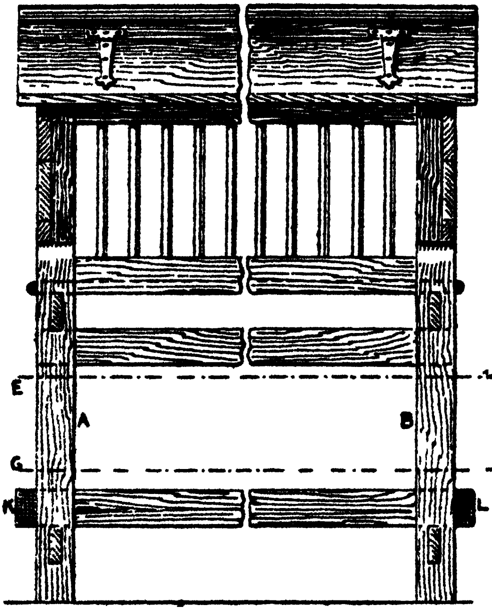


Fig. 486. Rack for Cattle—Front Elevation.

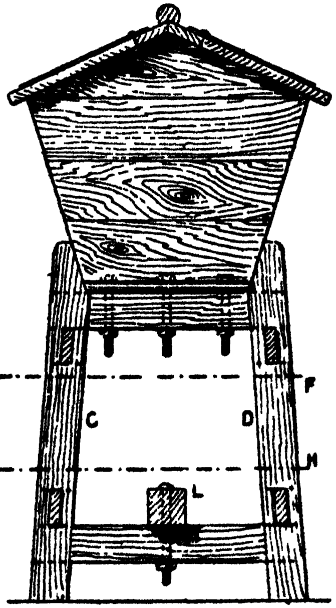


Fig. 487. Rack for Cattle—End Elevation.

834. Another mode of supplying cows and store cattle with hay and vetches—otherwise known as tares in many parts of the country—is to be found in the wooden cattle rack, illustrated in Fig. 486, which shows the front

Cattle rack.

Dimensions.

Construction.

elevation, and in Fig. 487, which shows the end elevation. The cattle rack may be as short or as long as the home carpenter pleases, that is to say, it may vary in length from 4 feet to 8 or 9 feet. Supposing the diagram to be drawn on a scale of ¾ inch to 1 foot, the measurement of the rack itself, independent of the stand, would be 15 inches across at the very bottom, and 22 inches across along the line of junction between the first and second pieces of board of which the end is formed. The height over all, including the thickness of the bottom board and the capping which forms the ridge from end to end, is 22 inches, and the height at the corners, taken vertically, is 16 inches. These are not to be taken as hard and fast dimensions, but in every case the builder of the rack must be guided by circumstances and his own requirements. The construction is in itself simple enough. First of all, two stout frames are made to carry the bars of the rack, which may be of iron or of wood, as the home carpenter may desire. Should it be decided to have the bars of iron, they need not be more than from ¼ inch to ¾ inch in diameter; but if of wood, they must be from ⅝ inch to 1 inch in diameter, and, if the rack be a long one, they should not be less than from ¾ inch to 1 inch. The frames must be made of sufficient width, as far as the top and bottom rails are concerned, to allow of these rails being bevelled sufficiently along the outer edges at top and bottom to touch in every part the boards that form the bottom, and to afford a resting place all along to the lid that closes down on it and which projects at the ends and overhangs the frames before and behind.

Putting front, back, ends, and bottom together.

835. As soon as the frames have been made they may be connected by nailing on the boards which form the ends, which should be, at least, 1 inch in thickness, and the bottom may then be nailed on also to the bevelled edges of the lower rails of each frame and the straight edges of each end. At the top, the sloping board destined to receive and support the covers, or lids, on either side. The boards that compose the ends may be put on separately, but, to my mind, it is better and easier to complete each, and before nailing or screwing them to the frames, connecting the boards by a groove and tongue, or even by dowelling or rebating, so that the edge of one board laps over and fits into the rebate of the board next to it; but dowelling is easier, and sufficient for every practical purpose. The topmost board at each end must be cut to shape at the proper inclination, and before the top is put on care must be taken to mark, and, indeed, make with a centre bit, or other boring tool, holes for the entrance of the bolts, by which the rack is afterwards to be bolted down to the rails of the stand on

Cover, or lid.

which it is supported. Two strips of wood, also 1 inch in thickness or thereabouts, are then fastened to the sides, or ends, in order to connect them at the ridge at the top. These should be suitably bevelled along the upper edges to form a close junction, and the line of juncture covered and hidden from view by a circular capping, or ridge piece, of the shape shown. The slips, or strips of wood, to which the movable parts of the cover, or lid, on each side, are attached by hinges, are about 3 inches in width, and the movable part itself about 12 inches in width. If these movable parts are formed of two pieces of wood each 6 inches wide, as doubtless they will be, they should be connected by a groove and tongue-joint, or dowelling, or rebated, that edge may fit over edge, as in the case of the sides, if the boards that form them are rebated, and they should be strengthened by slips screwed across the two boards thus conjoined in the direction of the width. The movable parts of the cover, or lid, on each side are hung to the slips that form the roof ridge, so to speak, by means of T, or cross-garnet, hinges The lids should be fastened down to the top rails of the frames by staples passing through slots cut lengthwise in them, a peg being thrust through the loop of each staple. The staples, etc., are not shown in Fig. 486, owing to the break in the diagram, this being done to avoid having an illustration of too great a size and length for the page.

Construction of stand for cattle rack.

836. This disposes of the rack proper, and we have now to consider the stand on which it is supported. This in the diagrams given, and according to the scale on which we are working, namely, ½ inch to 1 foot, is 25 inches in height, measuring from the ground to the upper edge of the trestles, so to speak, on which the rack is placed. The stand, it should be said, should be made of a height suitable to the height of the animals which are to draw their fodder from it. It will be too low for a cow or a bullock, but it will do very well to show the principle. For a cow, or for a yard-fed ox, from 2 feet 9 inches to 3 feet will not be any too much, but the home carpenter will be able to ascertain the shoulder height of his cow, or cows, and work accordingly. Another object in view has been to diminish the size of the diagrams, for it is by no means so easy to make a break in legs of divergent character and preserve the proper inclination, as in a figure, or part of a figure, in which you have to deal with parallel lines only. I may, however, give this wrinkle to the amateur mechanical draughtsman, namely, that if he wants to effect a reduction of this kind the best thing to be done is to construct his diagram of full size and then take out an intervening space and move up the lower part, as, for example, the parts of the legs A, B, C, D,

between the dotted lines, E F, G H, running across both diagrams, and then bringing the lower parts, or the line G H, closer to the upper part, or the line E F, leaving but a very slight interval between them. If, however, I had done this I might have puzzled many of my readers, and it is for this reason that I have refrained from doing so.

The legs of the stand, and the rails that connect them.

837. For the legs and rails take pieces of timber, 3 inches square, and cut them 3 inches in length, shaping them at top and bottom, as shown in Fig. 487, and, after doing this, make mortises in each for the tenoned ends of the rails. Thus, the lower rail across each end will enter the legs at 6 inches above the ground, taking the distance to the lower surface of the rail. Then, as the timbers are 3 inches square, the lower front rail will enter the leg at a height of 9 inches above the surface of the ground. Measuring downwards from the top of the leg, the upper rail, as shown in the end elevation, will enter the legs just 4 inches below the upper end, and the front rail at 7 inches. It will be best to shoulder the tenons slightly in every case, that is to say, to reduce them from ¼ to ½ inch above and below, recessing the leg to admit of a slight bearing for the end of the rail itself, from which the tenon proceeds. This will be better understood from an examination of Fig. 488, in which a section of the upright, or rather leg, to the left in Fig. 487, is taken parallel to the front of the leg, according to the front elevation. In this A is the end of the tenon of the upper end rail, the reduction of the tenon being shown, but not the recession of the leg on which the end of the rail rests, for this is out of sight. At B the entrance of the front rail into the leg is shown at B, and in this the recession of the leg, the entrance of the full size of the end of the rail to a slight depth, and the reduction of the tenon by shouldering, is also shown. From this the home carpenter will see that a little wood is left throughout the entirety between the tenon at A and the tenon at B, or the mortise at A and the mortise at B, as he may be content to view it or style it. The mortise and tenon joints throughout should be treated in this way, and the whole structure wedged up in the usual way and fastened with wooden pegs instead of nails and screws.

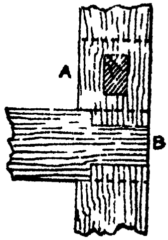


FIG. 488. Recession of Uprights and Shouldering of Tenons

838. Nothing now remains to be done but to strengthen the structure with a bar of the same width and thickness as the rest of the material used for the stand, and resting on the centre of the lower rail across the end elevation. This is necessarily hidden in the front elevation, in Fig. 486, with

Bar across lower rails, and connection of rack and stand

the exception of the ends at K, L, the bar being cut of sufficient length to project beyond the lower rails for 2 or 3 inches. This bar is bolted to the lower rails for the sake of imparting a greater degree of strength, security, and stability to the entire structure. The last operation in connection with the stand is to bore holes through the upper rail, as shown in Fig 487, for the reception of ¼-inch bolts, by which the rack is bolted to the end rails through the bottom. This is an operation of some nicety, as the bolts do not pass through the centre of the rail, taken longitudinally, but through a line that must be drawn by the marking gauge, set to 1 inch, beyond the inner edge of the rail This is owing to the thickness of the side which covers one-third of the width of the top rail, leaving two-thirds, or a width of 2 inches, for the bolting of the bottom of the rack to the rail. In case of wet weather, or extreme heat, it will be well to protect the entire top by a piece of tarred canvas thrown over it. This will prevent both swelling and shrinking of the wood that forms the cover or lid to too great a degree under the influence of the weather.

Fig. 489

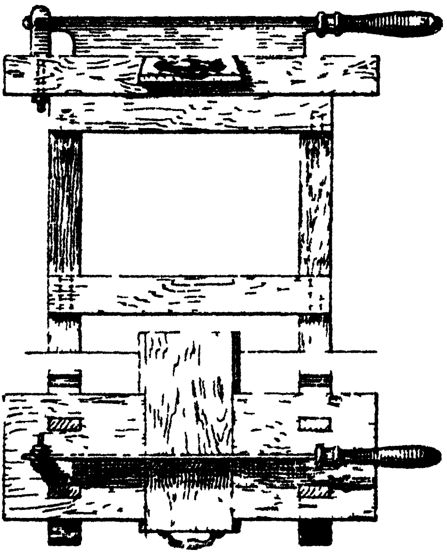
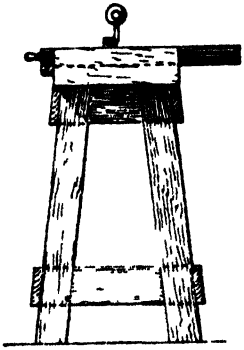


Fig 490



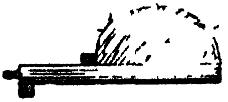


Fig 492

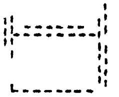


Fig 491

Fig 489 Root Cutter for cutting up Turnips etc for Cattle Front Elevation Fig 490 End Elevation Fig 491 Plan Fig 492 Slide withdrawn with Half of Turnip on it

839. The next thing to be described is a root-cutter, which the home carpenter may make himself, the knife excepted, for slicing up Swedes and mangold wurzel. In this home-made machine considerable strength and

Root-cutter for slicing turnips, etc.

stability are required. The front elevation, end elevation, and plan, as seen from above, of this root-cutter are shown in Figs. 489, 490, and 491 respectively; and these diagrams, for clearness' sake, are drawn to a scale of ¾ inch to 1 foot. The first thing to be done is to select a sound and well-seasoned bit of wood for the top of the bench, or stool, 30 inches in length, 10 inches in width, and 3 inches in thickness when planed and trued up. The height of the machine must depend entirely on the will and desire of the home carpenter; and I may suggest that from 2 feet 6 inches to 3 feet, according to the height of the person who will mostly use it, is a good height for it, 2 feet 9 inches being a good average height. In the diagrams, however, the principle of construction, rather than the height of the machine, is the chief thing that it is sought to explain; and so, for the sake of saving space, the legs in the front or side elevation and the end elevation before us have been taken at 2 feet. Cut the material for the legs, therefore, in lengths rather more than 2 feet to allow for the inclination of the legs, and the protrusion of the tenon by which each leg is connected with the top through the top, and let the stuff for the legs be about 2½ inches square. Mortise and tenon these legs into the top in the manner shown in the diagrams, and let the mortises be cut at a distance of 3 inches from each end measuring inwards, and about 1 inch inwards from the outer edge of the under surface of the top, or a little more. Connect the legs by rails, in the manner shown in Fig. 490, paying attention to the manner in which the depth of the tenons of the top rail is reduced to half the thickness of the rail in order not to carry the mortise to the top of each leg, just where it is tenoned to enter the top, which would tend too much to weaken the structure. Connect the holes thus made and insert into the top by rails at the side, coincident in width with the depth of the rails, which is 3 inches, by slips of wood of the same width and 1 inch thick, which, when nailed in their places, have their top and bottom edges in the same plane as the upper and lower surfaces of the rails, and hide or mark the ends of the tenons. This completes the construction of the stool or bench.

Construction of stool.

840. There are two points with reference to the home-made root-cutter that yet require consideration, namely, the knife by which the roots are sliced, and the slide by which the roots are brought under the edge of the knife from one side to the other until the whole of the root is sliced up. Let us take the knife first, and to get this there is but one course open to the home carpenter, and that is to obtain a knife fit for the purpose through his ironmonger, or dealer in tools. The knife is shaped as shown in Fig. 489. The

Marking out and cutting grooves.

etc., etc., are said to be "returned". To proceed, however, the marking is completed by drawing the diagonals D O and F P, and marking the other side from the points A, C, E, G in a similar manner, and drawing similar diagonals. This done, saw cuts, with a tenon saw, are made through C D and E F, in the direction of the diagonals D O, F P, the diagonals on the other side showing if the saw cuts have or have not been well and truly made, by the coincidence or otherwise of the saw cuts with the diagonal lines. The wood thus separated from the upper half of the top, above the line O P, is then cut away with mallet and chisel, gradually, deliberately, and carefully, and the bottom is finally reduced to the same level by the aid of a broad paring chisel or router. It is as well always to make the groove before making the slide that has to work in it, and thus to fit the slide to the groove.

Formation of groove by amateur carpenter

843. Let us now review the irregular, or amateur carpenter's, way of making the groove. He will in all probability elect to make the top of the bench of two pieces of wood of the proper length and breadth, but each of them 1¼ inches thick. Putting one on the other he will screw the upper piece hard and fast to the lower piece, taking care not to put any screws *within* A B on the outside, and G H on the other, but putting in, at least, four good screws along A B and G H, but, at least, at a good 1¼ inches to the left of one and to the right of the other. The lines of screws are shown in the plan and returned in the elevation to show that the screws are well clear of the sides of the groove, and that there is no danger of coming on them unawares. Having marked out the extent of the groove to be cut, in the manner described above, the home carpenter will proceed to make his saw cuts with a tenon saw. He must watch the progress of the saw carefully, lest it go astray and stop it directly it comes in contact with the lower piece. When he has got safely through the second saw cut he will know it by the free motion of the piece D O P F, and when the part of the upper piece of the bench thus released is gently knocked out, he will find his groove ready to hand without the need and trouble of removing the wood with mallet and chisel, and reducing the bottom to a level with paring chisel and router. He must then smooth down the roughness of the edges that now overhang the bottom of the groove with some fine sandpaper applied by placing it over a piece of wood, accurately bevelled to correspond with the side of the groove. The groove finished, he may proceed to make the side in the manner already described.

844. We are told by Mr. Cuthbert W. Johnson, in his excellent compila-

tion, the *Farmers' Encyclopædia*, basing the information respecting the cowhouse on passages in *British Husbandry* and the *Harleian Dairy System*, that it should be "a capacious, well-lighted and well-ventilated building, in which the cows or oxen can be kept dry, clean, and moderately warm; a temperature of about 60° is perhaps best. It is a mistaken idea that cattle suffer materially by *dry* cold. It is the wet and damp walls, yard, and driving rain, and fogs of winter that are so injurious to them. In this respect the Dutch farmers are very particular. They have their cows regularly groomed, and the walks behind them sprinkled with sand. A clean and dry bed, a portion of a trough to give them water, and another portion for their oil cake, or mangel, or turnips, and a rack for their dry food, will all be necessary comforts. These, with regular feeding, a lump of rock salt in the manger, and occasional variations, if possible, in the food, are the chief points to be attended to in the stall arrangement of cattle."

Notes on cowhouses in Holland.

845. Having this before us, we can easily recognise the points to which we must chiefly attend in fitting up a cowhouse; but we must remember that such a cowhouse, as is pictured above, is for *stall fed* cattle, which are kept in the house during the winter, and do not leave it. It is seldom, however, that cows are treated in this way with us, for they leave the cowhouse, even in the depths of winter, during the day, and have, at least, access to the farm yard, if they go no further. The chief requisites, then, in our cowhouse will be capacity and good ventilation. A temperature of 60° cannot be attained in any cowhouse in the winter unless it be a closed building, and the temperature be increased by the warmth proceeding from the animals themselves. Ventilation can be easily obtained and maintained by means of a louvre, which I will describe presently, and this without draught. We will suppose that we have a shed, walled at the sides and back, and entirely open in front, covered in with a good roof—whether spare or lean-to it does not matter, for possibly the shed may be built against the end of a barn, in which case it would be a lean-to; that the shed is large enough to hold three cows comfortably; that the owner has three cows, and that the cows are kept in the yard on which the cowhouse opens. Let us see, then, what we can do to make it thoroughly fit and comfortable for the cows, and to close them in at night. We shall have to deal, as in the case of the stable, with partitions, mangers, and racks within the building, and means for ventilation and closure; but, first, let us suppose that the building is 21 feet in length inside measurement by 12 in width, and that it is a lean-to, and that the cows are allowed free access to the yard by day, which is suitably littered

Chief requisites in a cowhouse.

down with straw, and has a trough and cattle crib within. All we have to do is to deal with partitions, loft, means of closing up the front, and interior fittings.

Plan of interior of cow-house.

846. To show how it is proposed to divide the interior for the accommodation and housing of three cows, it is necessary to have recourse to a plan which is given in Fig. 495. This plan is drawn on a scale of $\frac{1}{8}$ inch to 1 foot, and, although large enough as a mere plan, is not large enough to show details of the mode to be adopted of closing in the front, which will be shown in separate figures on a much larger scale. The building, as it originally existed, is supposed to be open in front from one end to the other, and to have been built against the side or end of a barn, which is represented by A B. Thus, in making the cowhouse it was only necessary to put up the ends or sides A C and B D, and to cover in with a lean-to roof, resting in front on a substantial brestsummer or beam from C to D, supported by two rough posts of irregular form at E and F. Let us take it that the under surface of the beam is 7 feet above the ground level, and that it is 4½ inches thick and 9 inches wide. It is represented by the space between the dotted lines running from C to D. The length of the cowhouse within being 21 feet, it is divisible into three spaces of 7 feet each, which affords a sufficient width for a stall. Having set off a space of 3 feet 9 inches from the ends of the side walls, namely C D and E F, which includes the width of the beam or wallplate, and the path or walk from end to end in front of the stalls, there will be a space of 8 feet 3 inches left between E F and the back of the building, which affords a good length for the stalls and admits of the construction of a manger for fodder, 18 inches in width over all, and 15 inches deep, if it is intended to dispense with a rack, which is by no means absolutely necessary. The home carpenter can put up a rack from end to end if he pleases; and reference to the preceding chapter on stable fittings will show him how to manage this. I should be led myself to dispense with the rack as being far less convenient for a cow than a horse, as may be seen at once by comparing the back and neck of each animal; for, in the former, the line of

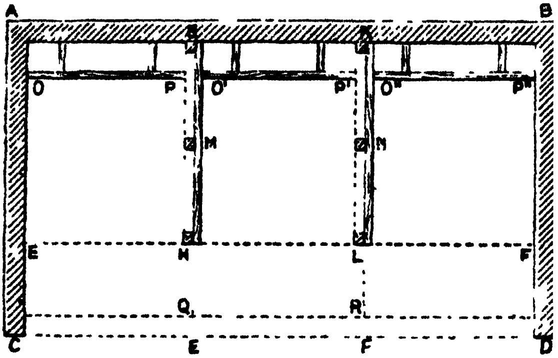


FIG. 495. Plan of Cowhouse.

the back and neck are very nearly, if not quite, in one and the same straight line; whereas, in the latter, the neck is curved or arched, and the head is raised considerably above the line of the back, which is sinuous, and by no means straight.

847. Proceeding, however, with the construction of the partitions between the stalls, put up at G, M, and H three stout posts, say 4 inches square, and the same at K, N, L, say 8 feet 9 inches in height, which will leave sufficient at the top of each for the cutting of tenons to enter mortises in beams of the same dimensions, extending from G to Q, and from K to R. Two beams of the same dimensions should run along the inside of the side walls from the wallplate to the wall A B. All these beams should rest on the wallplate at one end, and the other end should enter a hole cut for its reception with a cold chisel, to the depth of about half the thickness of the wall, or say 4 inches. The reason for putting up these beams will be apparent presently. When the posts and beams are in place, the partitions may be completed at once, by nailing to each line, or row of posts, three or four stout poles at intervals of 18 inches, or 2 feet, putting the first pole, in each case, the same distance above the level of the ground, or floor level. These poles are indicated in the plan by the shaded spaces G M H, K N L. The best thing for these horizontal bars, supposing that the posts at G M H, K N L are posts of sawn material, will be poles of larch or fir sawn in half, and nailed on with the flat part against the posts. The same kind of poles similarly cut, will do equally well, even if the vertical poles are rough and round in themselves; but in this case it will be as well to notch the standards slightly, to afford a better bearing for the transverse poles. With regard to the manger, a framework of posts and rails is required in each stall, and let the height of the manger be 2 feet 6 inches. It will be less troublesome to make two frames—one for the back, and another for the front—and to connect these with slips, battens, or pieces of split poles—bottom and front being made in the same manner. Let partitions across the manger in each stall, as shown at O P, O′ P′, and O″ P″, and let these, in each case, be from 18 to 21 inches from each end of the manger. Board these up solid in front and at the sides, back, and bottom, and line each with zinc, the zinc being soldered up at the angles to make water-tight compartments. The compartments O, O′, and O″ will then afford water troughs, and P, P′, P″ troughs for sliced roots. If it be desired to tie up any cow in the manger, it may be managed by fitting the cow with a simple headstall, or halter, with a rope attached to it at one end, the other passing through a hole in a cleat attached to the manger, and then

Partitions in cowhouse.

Division of manger.

through a piece of wood, in the shape of a round mallet, about 7 inches long, and from 2 to 2½ inches in diameter.

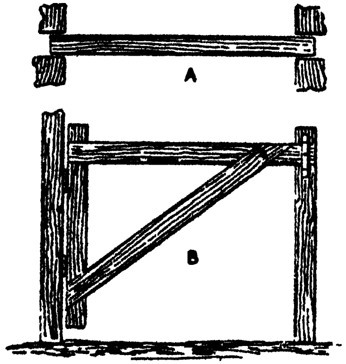


FIG. 496 Bars and Gates across Passage Ways behind Cattle in Cowhouses.

Bars and gates across passage ways in stables.

848. If it be wished to put any separative fencing between the stalls, in the lines H Q, L R, in the passage-way behind the cows, from end to end of the cowhouse, it may be done in the manner shown in Fig. 496. In this A represents a bar crossing the gangway from the post H to a post on the opposite side of the way, which will be mentioned and figured presently in the details of description of the front to be made by the home carpenter. The principle of the bar is just this. Apertures are cut in the opposite posts of sufficient size to receive the ends of the bar, which may be made of stuff 3 inches deep and 2 inches thick. The depth of each aperture must be sufficient to receive the end of the bar that is put into it, to a depth that will allow from ½ inch to 1 inch between the mouth of the aperture on the opposite side and the extreme end of the bar. Thus, supposing the space between the apertures to be 3 feet, and the depth of each hole 4 inches, the bar must be of a length not more than 3 feet 3½ inches. When the bar is adjusted there will be, or may be, if the bar be marked to this extent at each end, just 1¾ inches in each aperture, which is quite enough to keep the bar in its place. It should not work too loosely in the openings. This is the main principle on which all barriers of this kind are made. It is sufficient to prevent cows that are not tied up from moving from stall to stall and interfering one with another.

Gates as barrier across pathway.

849. The gate shown at B, in Fig. 496, answers the same purpose, but is made on a different principle. It is a gate of the old-fashioned "gallows" type and fashion, and was once used for temporary stoppage of ways in farm yards, in which, in some cases, a solid door was placed to close the opening at night, or whenever it might appear desirable to do so. The character and make of the gate is easily understood. There is a hanging post, hinged in the case before us to the post H, and the post L in Fig. 495, and from this, near the top, proceeds a transverse bar at right angles to it, which is supported by a diagonal strut, halved into the post and rail near the lower end of the former, and the free end of the latter, which falls against and into a notch cut for its reception in the post opposite that at H,

or L, as the case may be, in Fig. 495. When the end of the horizontal rail enters the notch in what is in reality the falling post, it may be secured by bolt or button, as the home carpenter may prefer.

Loft in lean-to cowhouse.

850. Let us now dwell a moment or two on the loft that it is possible to make above the stalls in our lean-to cowhouse. A sketch diagram of a section of the building in its original form, without partitions and fittings in the interior, is shown in Fig. 497, which, let me say, is not drawn to scale. In this A is one of the two posts which we supposed to be set, at the building of the shed, to support the wallplate B, running along the front from end to end, and designed to support the lower ends of the rafters, to which battens are nailed transversely to support and carry the tiles or slates, which form the external covering of the roof. An end of each rafter rests and is fitted on to the wallplate in the usual way, and the other rests on the wallplate D, which is securely fastened to the wall, E, of the barn or building--be it what it may—against which the lean-to cowhouse is placed. The mode of procedure to be followed in making the loft is very nearly the same as that which was described in the conversion of a building, similar to this, into a stable for a single horse. First of all, a series of joists, as shown at F, have to be placed across the building from front to back, one end resting on the wallplate B, and the other entering the wall E, cut for its reception, with a tool known as a cold chisel, at K. These joists should be from 15 to 18 inches apart, and better the lesser distance than the greater. A floor may be made with boards, as in the case of the stable; but I have known very efficient and secure lofts made across linhays in Devonshire by laying strong wattled hurdles across the rafters, and securing them from shifting by nails, staples, and other means. It is surprising what floors of this kind will bear in the way of weight. In this they resemble trellis or lattice work. Of course, they are rough in appearance, but compensation for this is found in their strength and durability. Openings for the extent of two or three rafters should be left just over the mangers, through which fodder may be thrown into them from the loft. In lofts in buildings of the lean-to

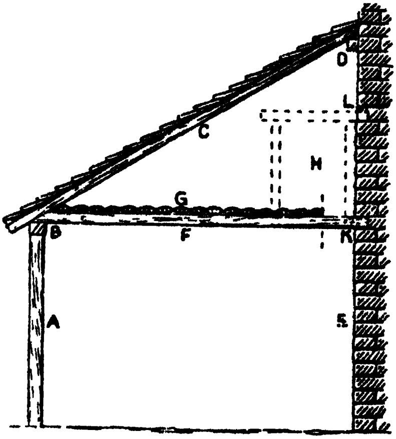


FIG. 497. Sketch Diagram of Section of Loft in Lean-to Cowhouse

Construction of loft.

class and character, the door must be formed in one or other of the end or side walls, as shown at H. The frame of the door, if of a substantial character, may be butted against the wall E, and the lintel of the door, entered as shown at L, or the doorway may be moved further to the left, leaving a piece of wall intervening between E and the right-hand jamb of the doorway at H. Access to the loft in the case of the cowhouse should be obtained outside the building.

Mode of fitting front with open gates and close doors

851. We may now pass on to the details of the front by which it is proposed to close in the building, and this we may do in such a way as to present a solid barrier to the entrance of driving rain, snow, etc., into the house, to be used in the cold days and colder nights of winter, or a barrier of gates which will admit any amount of air in summer, when it is not desirable to keep the cowhouse closely shut. The mode of fitting the front of a cowhouse with open railed gates and close solid doors, is shown in Fig. 498, and although the diagram may seem to be one of complicated character at first sight, the method of procedure is by no means as difficult as it appears to be on paper. It is drawn on a scale of ⅜ inch to 1 foot, and is, therefore, on a scale three times as large as that which was taken for Fig. 495, which is on a scale of ⅛ inch to 1 foot.

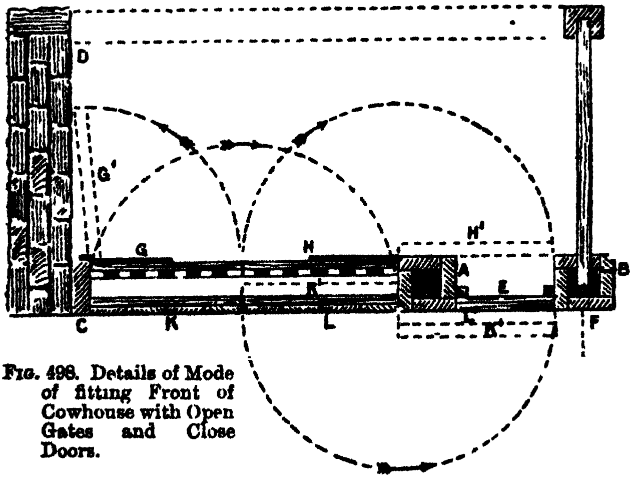


Fig. 498. Details of Mode of fitting Front of Cowhouse with Open Gates and Close Doors.

Posts to support wallplate.

852. It will be borne in mind that the wallplate in front on which the rafters rest was supposed to be supported on the end, or side walls, and on two stout but rough posts, at equal distances between them. Now, rough posts are by no means convenient or suitable for our purpose, and we must withdraw them and substitute others in their place. The wallplate was supposed to be 9 inches wide, and it will be useful to us to make our posts 9 inches square. Although there would be no difficulty whatever in getting posts of this size and solidity, there is no necessity for it; for hollow

posts will suit our purpose as well, if not better, and they are as strong and capable of sustaining superincumbent weight as solid posts. The home carpenter will remember that iron columns, hollow throughout, are used to support great weights. Let us make our posts of 1½-inch, or 2-inch boards, nailed or screwed together after the manner shown at A and B—indeed, in precisely the same way that we follow in making a down pipe of wood to carry off water. Thus we find that the hollow part of the post is 5 inches square, and contains an area of 25 square inches, and the united area of the boards employed, taken in section, is 36 square inches; so we effect a saving of very nearly one-third the material; and as timber is sold by the cubic foot, our timber, on a rough calculation, will cost us nearly one-third less; although to make such a post as I have been describing, would cost us more in labour. We shall want five such posts for the front, and two stout planks, 2 inches thick, 9 inches wide, and 8 feet in height, to fix against the end or side walls, as C, shown in section, is fixed to the wall D, which is also in section. Our posts, like C, must be 8 feet high.

853. But how are we to get our posts in position? How are we to take away the original posts and put the new posts in their place? To fix the planks to the inside of the side walls is an easy matter; but how about these? The old posts in all probability are tenoned into the wallplate, and apparently it will be no easy matter to get them away without destroying them, that is to say, without cutting them in pieces. Well, the first thing that we must do is to shore up the wallplate, that is to say, we must introduce temporary supports, and these must be longer than the original posts, and those that are going to take their place. Suppose we cut the shore 8 feet 2 inches long, and having put something hard below them, such as a large flat stone, or some bricks, embedded in the earth, let us knock them into place with a mallet, or beetle, until they are nearly, but not quite, vertical. It will not hurt the roof in the slightest degree to do this; for when the work is done, and the wallplate is allowed to resume its former position, it will be found that the roof will settle down unshaken and as sound as ever in every way. Let us suppose that two shores have been placed, one on each side of the intermediate posts, and that we are free to do what is necessary for the removal of the original posts. The first thing to be done is to examine the heads of the old posts, and see in what way they have been connected with the wallplate. If tenoned and pinned with wooden tree-rails on pegs, as they should be, the pins, if properly put in with a taper bit, may be knocked out, and when the earth has been removed from the

Placing new posts in position.

Shoring up wallplate.

bottom of the post and from under it, it may be easily withdrawn. If, however, it has been fastened by nails passing through mortise and tenon, pass a saw under the wallplate and through the tenon, and then excavate at the base of the post and withdraw it. Then, having everything clear, mark with accuracy the limits to which the top of the new post will extend, and nail, or screw, to the under part of the wallplate, just where the tenon of the original post has been, a piece of board 5 inches square and about 1½ inches thick. This will be inserted into the top of the new post when it is placed in position, and, fitting tightly within it, will prevent any motion either inwards, or outwards, or laterally to the right or left.

854. As a matter of course, the next thing to be done will be to make a solid foundation for the new posts, and it will be as well to insert wood bricks in the top course, and to nail down to these a broad piece of timber, say from 10 to 12 inches square and 2 inches thick, with a piece 5 inches square and about 1½ inches thick, for the base of the new post to fit over the one and not upon the other. The shores must now be knocked upright, and the wallplate wedged up to allow of the insertion of the new post below it, each in its respective place; and when this has been done, and it has been ascertained that the pieces that are to fit into the tops of the posts have been well and truly placed, the shores must be knocked away, and the roof allowed to settle into position. The home carpenter will be surprised to find what a sound and solid job it is that he has got through, and how admirably adapted it is for the purpose in view, namely, the affording means of fixing the gates and doors that are intended in one case to facilitate the admission of air freely to the interior of the building in the summer time, and in the other, to close it so effectually in the winter as to exclude rain and snow, and to keep everything snug and comfortable within. It will be noticed that there is a space between the hollow posts of 13½ inches, as shown at E. This should be closed up, and it will be as well to do this by boarding up the lower part either by weather boarding, or vertical boarding, with fillets over the joints, and to fill the upper part with glass, for the purpose of admitting light into the cowhouse when the doors are closed. To the right and left of E are shown fillets, or slips, to which the weather boarding, or edges, of the outside vertical boards may be fastened; and it will be useful to place a shelf between the glass and the wood at their junction, which, being 13½ inches long, and from 6 to 7 inches broad, will afford a lodgment for anything in the form of liniment, cattle medicine, etc., for which no suitable or convenient corner or recess will be found elsewhere.

Completion of the fixing of the new posts.

855. The next point that demands consideration will be the gates and doors. It is with the position and attachment of the gates that we have to deal most, and not with the mode and manner of making them. As the entire space from the wall D to the central line of division of the hollow post B is exactly 7 feet, or 84 inches, and space equivalent to 29 inches, namely, C = 2 inches, post A = 9 inches, space between posts = 13½ inches, and half of post B = 4½ inches, has been taken out of this, there remains an opening of a space of 55 inches between C and A, which, when divided by 2, gives 27½ inches, as the width of the double gates and the double doors, for each of these must be made in two parts. The gates, therefore, that are required will have to be made 8 feet in height, and 2 feet 3½ inches in width, and the doors of the same dimensions. The gates will be made of ledges 1 inch thick, and 3 or 4 inches wide, and of these three will be required —one near the top, one near the bottom, and a third in the centre—and vertical rails will be nailed to these, formed of battens, 2 inches in width. The doors will be made of ledges of the same size and number; but they will be composed of vertical boards nailed to the ledges, with thin slips to cover the joints, or it will suit the construction of the door and the mode of hanging better, if the boards are connected by overlapping rebates, or a groove and tongue joint. The valve G of the double gates will then be hung to the upright board C by T or cross-garnet hinges, and the valve H to the hollow post A in the same manner. The gates will open inwards, and when open to the fullest extent, G will assume the position shown by the dotted lines at G′ and H, the position H′. The valves K and L of the door will be hinged to each other, so that opening in the direction indicated by the semicircle and the arrow on it—in the same manner as the movements and direction of movements of the gates G and H are indicated by dotted arcs and arrows—will assume the position K′ and then L, which has been hinged to the post A, so as to open outwards, will fall backwards, as shown by the arc and arrow, into the position L′, carrying K from K′ outwards with it into the position shown by K″.

Size of gates, etc.

856. From the single and simple cowhouse let us pass on now to consider how we may contrive to place a cowhouse, stable, and coach-house under one roof, for the benefit of those who may be intending to build, and as a suggestion to many in the colonies and British dependencies, who may not have sheds and buildings that can be adapted and manipulated to meet their requirements, and who, therefore, must build. We will proceed on the supposition that the intending builder has three cows, three horses, a carriage and a dog-cart, and seeks to provide

Composite building, comprising cowhouse, stable, and coach-house.

accommodation for all of them in a triple building. Not a bit of room was wasted in the cowhouse, and in Fig. 499 I have imagined three blocks, equal in size to the cowhouse shown in Fig. 495—that is to say, having a measurement within of 21 feet from end to end, and 12 feet from back to back, put together in the manner shown, A being the cowhouse in the centre; B the stable to the left; and C the coach-house to the right. Room for harness, saddles, bridles, etc., and all that is usually kept in a saddle room, may be found in the coach-house.

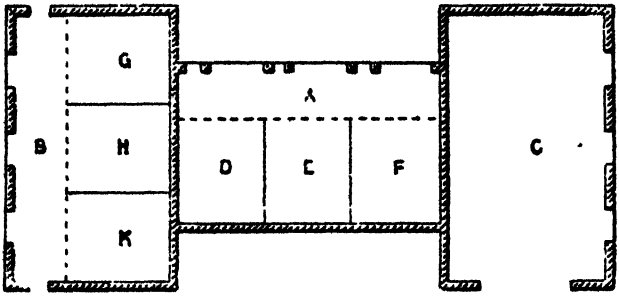


FIG. 499. Plan of Composite Building, comprising Cowhouse, Stable, and Coach-house under one Roof

The cowhouse.

857. Let us deal with the cowhouse first. The reader will easily recognise its similitude to and correspondence with the plan given in Fig. 495, and although it is on a very small scale—a scale of $\frac{1}{16}$ inch to 1 foot—the division into three stalls D, E, F, the gangway to the rear of the cattle at A, and the double posts supporting the wallplate and the openings between them are clear enough. There is only one piece of containing wall that really belongs to it, and that is the wall at the back of it, for the side walls are formed, that to the right by one side of the coach-house, and that to the left by the back of the stable. With regard to aspect, if the stable fronts towards the south, assuming the side in which the windows are to be the front, the cowhouse will front westward, and the coach-house will have a northern aspect as viewed, with reference to the windows by which it is lighted, or an eastern aspect having regard to the door. Thus in the matter of aspect the arrangement is favourable to the animals that are to be kept therein, for the cowhouse is protected from north-westerly and south-westerly winds and gales, by the flanking corners of the stable and coach-house, which will break much of the force of each. The arrangement of the triple building is economical, as by the disposition of the three parts the interposition of the central portion in the manner shown adds but little to the cost of the building as far as the walls of it are concerned.

858. The stable is very like the cowhouse in its internal arrangement, inasmuch as the stalls for horses, G H K, correspond in number and position

The stable.

to D E F, the stalls for cows, and the gangway B in the former is identical with the gangway or passage A in the latter. The chief point of difference is that there is a door at each end of the passage—one fronting east and the other to the west. The arrangement has this advantage, that the horses can be taken out in either direction, and thorough ventilation of the stable may be effected in a few minutes by opening both doors, and yet the animals be completely protected from direct draught The stalls may be open, or made as loose boxes, according to pleasure The interior of the building is well lighted, and the windows may be made to open on hinges by the aid of cords attached to cleats, if made in the form of a semicircle, as shown in the sketch view in Fig. 500, or square, and working on pivots in the centre of the sides of the frame, and made in a way that has been described elsewhere in this volume. Prettier modes of dealing with the exterior may be easily devised, I do not doubt, but in mine I have been actuated by practical and utilitarian motives. If there be any objection to locating the harness and saddles in the coach-house, a small annex may be built to the south of the stable, and entered by a door that takes the place of the central window; but this would break and put an end to the symmetry of the building, which I trust no one would be anxious to do. The coach-house in reality affords ample room for everything of this kind.

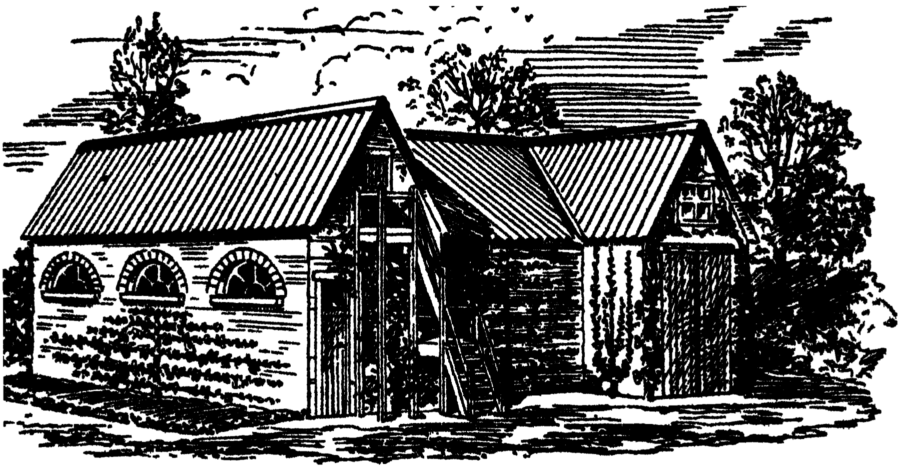


Fig 500 Perspective View of Threefold Building showing Southern and Eastern Frontages.

859. Proceeding to the coach-house, there is in reality very little to say about it. It is one large empty space, so to speak, without any divisions, and consists of just four walls and a concrete or brick-paved floor. The large folding doors are in its eastern gable end, and in the side fronting north there are three windows, similar to those in the stable on the south side. These semicircular windows are hinged to the lower part of the frame, and open inwards—the extent of opening being controlled by a stay, and the windows themselves being actuated in opening and closing by cords. I have given in Fig. 500 a perspective sketch of the triple building, viewed from its south-eastern angle, or nearly so, and showing its southern and eastern frontages. The wall space is utilised for such fruit trees--chiefly pears—that will do well in this aspect, but cherries or plums may be substituted for pears if preferred. Where trees cannot be grown, the walls may be covered with ivy. The door in the gable of the stable which gives access to the loft is reached either by a ladder, as described in the previous chapter, or reached by a flight of external steps, the construction of which will be described a little further on. As I have indicated in Fig. 500, a south border may be made for trained trees, as already suggested, and a border may be made in the recess between stable and coach-house at the back of the cowhouse. Another border may be made on the north side similar to that on the south, in which Morello cherry trees and Victoria plums may be placed, and the western gables of the stable and coach-house may be made available for choicer kinds of wall pears. The owner may, perhaps, think there will be little chance of any of the fruit being left to be brought to table.

The coach-house.

860. But to return to the threefold building. I have something to say about the roof and a certain way of covering it in, which, I am sure, will prove useful to many a home carpenter for various buildings and under various circumstances. It must not be forgotten that joists are carried over stable, cowhouse, and coachhouse at the height of 8 feet, which is the height of the walls; and that the loft thus formed should be open throughout for the storage of fodder over the stable and cowhouse, at all events, and preferably over the coach-house too, for it is both desirable and useful to have plenty of hay and straw at hand, and there is nowhere else so handy to put it in as the loft. And for the sake of having as good and as roomy a loft as possible, it may be as well, when the builder does not mind the additional cost, to carry the walls 18 inches or 2 feet higher all round, and carry floor joists from wall to wall in the usual way, at the height of 8 feet. If the joists are 6 inches deep, this will give a height of 8 feet 6 inches

Roof of corrugated iron.

within the building, from paving to under surface of flooring, and better headway by 12 or 18 inches in the centre, and greater facility for motion from place to place all over the loft, with valuable additional space for stowage of hay, straw, etc. This, however, the home carpenter will easily understand, and I need say nothing further on the subject. It is to the construction of the roof that I now wish to draw his attention. The corrugated iron that I am advising him to use is made in sheets of different sizes, and a useful size will be found in sheets measuring 7 feet 6 inches by 2 feet 6 inches, or thereabouts. The iron sheeting used for roofing is so called from its *wrinkled* appearance, the sheet being ridged and furrowed from side to side, thus: ⌒‿⌒‿⌒‿⌒. Its price when new may be ascertained from any ironmonger, but it will be as well to say that amateurs who desire to keep down cost as much as possible, may do so by sending for a price list to North or South London dealers in this speciality, who supply second-hand sheets; that is to say, sheets that have been used before on other buildings, and sheets that are slightly damaged—damaged rather in the galvanising than in any other way—at fairly low rates; and where there is much space to cover, this is manifestly a great consideration, and certainly a desideratum.

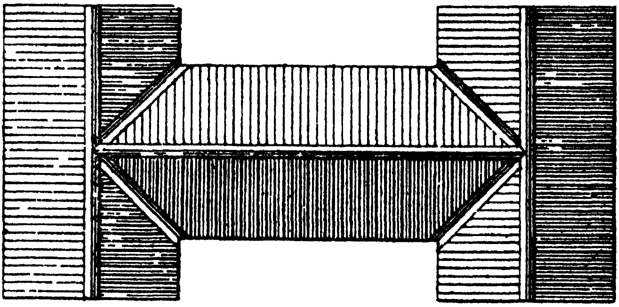


FIG. 501. Plan of Roof of Combined Stable, Cowhouse, and Coach-house.

861. Now, it will occur at once to the home carpenter that if the covering material is in sheets of the size mentioned above, that there will be a difference in the construction and framing together of the timbers of the roof; and so there undoubtedly is, for, as the roofing material is far larger and far heavier than slates, tiles, and wood, roofing felt, etc., with which we have hitherto been accustomed to deal, I will show the construction presently in a plainer kind of roof than that shown in Fig. 501. When roofs

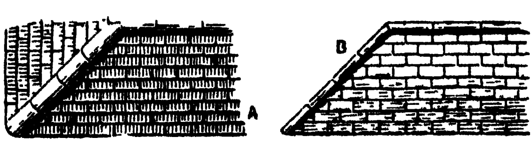


FIG. 502. Hipped Roof in Plan (A) and Elevation (B).

are so constructed that planes meet so as to constitute planes that are at right angles to each other, as in this case, the planes must meet in diagonal lines, or the lines of junction of the planes of which the roof is composed must of necessity be in diagonal directions. When the line of junction is raised, and proceeds from corner of ridge of roof diagonally to the eaves, the roof is what is termed a *hipped* roof, the edges of the planes, shown in plan at A in Fig. 502, meeting in a hip. The form is further shown in elevation in B. Gabled roofs have been shown often enough in this volume, and, in point of fact, the ends of the roof of the stable and coach-house, in Fig. 501, are gabled ends. When, however, the planes of a roof meet in a depressed diagonal, instead of a raised one, as shown in the junctions of roof of cowhouse in the centre of Fig. 501, with the inner slopes of the roofs of stable and coach-house respectively, the line of meeting constitutes what is known in building as a *valley*. Thus *hips* are always formed by the *outer* slopes of roofs that meet diagonally, and are formed by the inner slopes of roofs. In each kind of junction a different mode of securing the roof against the entrance of moisture at the junction or meeting of the planes must be adopted. Then, in the case of the hipped joint, the joint must be covered over with ridge tiles, as shown, which *overlay* the joint; but, in a roof with valleys, the sides or slopes of the roof must overlay the covering, so to speak, by which the joint is secured from the entrance of rain, etc., or

Roof of threefold building.

Hip in roof.

Valley in roof.

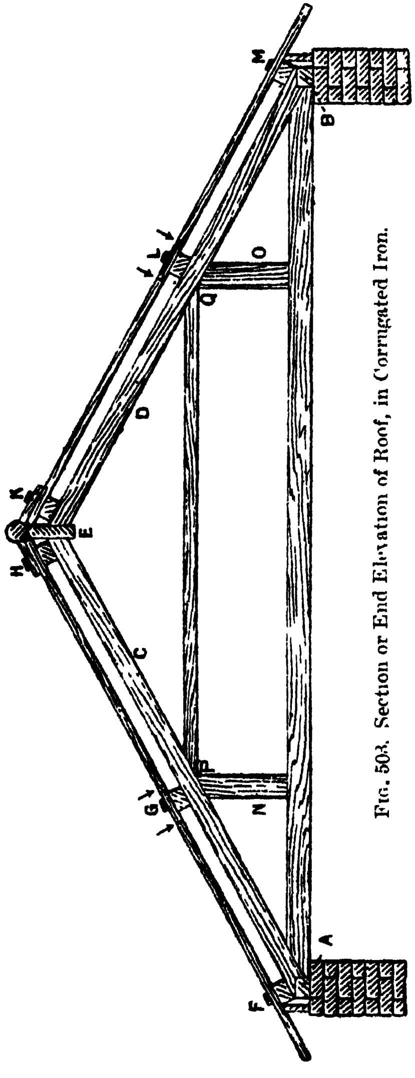


Fig. 503. Section or End Elevation of Roof, in Corrugated Iron.

the material of which the gutter is formed must *underlay* the slates or tiles, or any other material of which the roof is formed. The *valley* is usually made of lead, and the roofing material is laid over it. And the methods or forms of roof just described are precisely the same whatever the material may be, even if it be of wood or of corrugated iron.

862. But this brings one to the consideration of the construction of a roof in corrugated iron, from which the construction of the roof shown in Fig. 501 will be thoroughly understood; and before I enter on this I may say that there is no difficulty in cutting corrugated iron places in the form shown in the valleyed roof in Fig. 501, or in the form shown in the hipped roof in Fig. 502. It is done with a hammer and cold chisel; but the work takes time, and is jarring to the hand, unless the cold chisel is held in a hazel rod, as twisted for tying up faggots of wood, and as used by blacksmiths for holding the swages by which iron heated to redness is cut, or indented in any way. The "swages" of the blacksmith, in fact, are nothing more than short and heavy cold chisels, which first indent and then sever the material when impelled by the heavy blows that are delivered by the blacksmith's heavy sledge hammer. This will set at rest any compunction the home carpenter may happen to feel when called on to deal with corrugated iron.

Cutting corrugated iron.

863. In this country, in order to carry off the rainfall as speedily as possible, it is considered desirable to give roofs as high a pitch as possible—certainly, to give the roof a slope, or angle, of not less than 45° with the horizontal line of the walls of the building at the top, or, in other words, the wallplate on which the lower ends of the rafters are notched—and when the covering is of slate, or tile, or any such substance as wood, this is right enough; for, owing to the grain of the latter, the rainfall is apt to pass from it but slowly, and in the former, when the roof is too flat, it is possible at times that it may drive up under the slates, or tiles, as the case may be, and cause dampness, and wet spots on the ceilings of rooms immediately under the roof. This, however, will not happen when the roof is of corrugated iron, and if it did it would not matter so much, because there is no ceiling under the roof that would be damaged by the entrance of a little rain; so if the pitch of a roof thus covered in be low, the rainfall would soon find its way to the shoots or gutters below the eaves, partly owing to the "ridge and furrow" formation of the plates, partly to their large size, especially when compared with slates and tiles, and partly because there is nothing from the top of the plate to the bottom to impede or hinder its downward course. The only

Slope of roofs.

thing that can be said against this kind of roof-covering is, that owing to its resonance and power as a conductor of sound as well as heat, the patter of the rain is far more audible than it is in roofs otherwise covered. But in farm buildings this is a matter of no importance whatever; although it is not very pleasant in any building occupied as a dwelling-house, or used as a church, school, or place of meeting of any kind.

Construction of iron roof.

864. In Figs. 503 and 504, I have endeavoured to show as clearly as possible the construction of roofs of corrugated iron, as regards both the timbers of the roof, and the iron plates with which they are covered in; and I have been particular in this, because, owing to the comparatively small quantity of timber that is required and the cheapness of the plates, I am inclined to think it is far less costly, as well as being far more durable, than any other kind that can be made of wood. In Fig. 503 a diagram on the scale of ¼ inch to 1 foot is given, which exhibits an end elevation, or sectional view, of the construction of the roof, and especially of the disposition of the timbers of which it is composed. Let us suppose it to be a large shed, or cow-house, open at one end entirely, except at the gable top, which may, and, indeed, should, be boarded over, as there is no object, but rather the reverse, in allowing it to remain open to the entrance of the weather. I have supposed this building to be 20 feet in width from wall to wall, the walls themselves being included in the width; and as these are brick-and-a-half walls, that is to say, walls 13½ inches thick, the entire length of the building within is 17 feet 9 inches. The length is altogether immaterial, but I may say that in putting up any new building to be thus roofed, the home carpenter should make his working drawings, and be guided as to length, by the size of the corrugated plates that he is going to use, and the loss in length occasioned by overlaps at their junction, for they do not meet edge to edge vertically, so to speak, as slates and tiles do whose overlay is entirely horizontal.

The wall-plates, rafters and purlins.

865. The walls being in position, the first thing to be done is to lay the wallplates along them, as shown at A and B. As the rafters are notched on to them they must be substantial timbers, and not less than 4½ inches in width and 4 inches in depth. The rafters, which are all principal rafters and few and far between—say from 6 to 7 feet apart, or even more—should be of the same width and depth. Of these, two are shown at C and D, in their proper position. The mode of notching them to the rafters has been described elsewhere in this volume, and, to the best of my recollection, more than once, and it need not be repeated here. Moreover, it is shown

clearly enough in the illustration given. At the upper end they butt against a substantial ridge plate, about 9 inches deep and from 2½ to 3 inches thick, which runs from end to end of the roof. This ridge plate is shown in section at E. We now come to the timbers by which the roofplates of corrugated iron are sustained, and to which they are fastened down. These are timbers of the same size as the wallplates and rafters, namely, 4½ inches in width and 4 inches in depth, and they are laid on the rafters horizontally in the positions shown at F, G, H, K, L, M, in which they are shown in section or end view, according to the view in which we take Fig. 503, that is to say, whether as section or end elevation. The purlins are shown in the diagram as just laid on the rafters; it is better to notch them on slightly, cutting into the rafters and purlins at the places in which they cross, to the depth of ½ inch, and then dropping the purlin thus notched into the notches cut for its reception in the rafters, to which each purlin should then be fastened down.

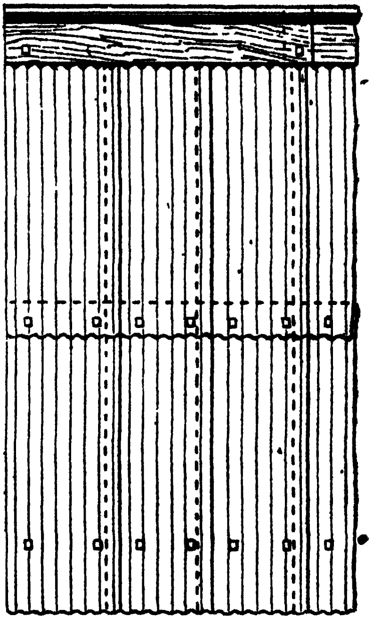


FIG. 504. Part of Roofing in Plan.

866. In a roof at which I was looking one day, I noticed that the purlins and rafters were *halved* together, so that the upper surfaces of purlins and rafters were in one and the same plane; but this was weakening both rafters and purlins to far too great an extent. The joint that I have recommended is a notched joint, which is of the nature of the halved joint, but falls far short of it in being less in depth. The home carpenter must always bear in mind this most important of all facts in carpentry—namely, that the parts thus put together have both been individually weakened to the extent of the depth of the halved joint. Thus, if two pieces of quartering, 2 inches square, are halved together, each piece is only half as strong for the sustenance of weight as it was before the notching or halving was carried out; and if one part has been notched to the depth of 1½ inches, and the other to the depth of ½ inch, the former is possessed of only one-fourth the strength that it had before it was notched while the other part is three-fourths as strong as it was, because

Effect of notching in carpentry and Joinery.

its depth or thickness has only been reduced to one-fourth of its original depth.

867. When the purlins are put in position they may be bolted to the rafters, or less firmly fastened to them by skew-nailing. It is a good plan to strengthen the timbers of the roof by perpendicular posts, as shown at N and O. These should be tenoned at each end into mortises cut in the joist A B and the rafters C and D, but the tenons and mortises should not be of any depth. Indeed, the depth of 1 inch and a similar width will be sufficient to keep them in place, especially if each be lightly shouldered into joists and rafters to the depth of ½ inch with regard to the former, and ¼ inch with the latter. A stay, or tie beam, about 1½ inches or 2 inches thick, and from 3 to 4 inches wide, may be nailed across from rafter to rafter, as shown at P Q. If the space between A B and E is not to be utilised as a loft, its presence will not matter in any way; but if it be intended to turn this into a loft by putting in lighter joists, that is to say, joists that are less in thickness than the principal joists, one of which is shown at A B—and no opportunity should be lost in turning every square inch of space to good account—the tie beam should not be added. In Fig. 503 there would be headway between the floor and ridge plate to the extent of 4 feet 6 inches, and if more than this be desired, the slope of the rafters must be increased so as to give the desired height of headway. The roof shown in Fig. 503 is, as I have said, one of very low pitch.

Timbers to strengthen roof.

868. The framing of the roof may now be regarded as finished, and we have only to consider the fixing of the iron plates of corrugated form that are to be used for covering in the roof. These are also shown in section at F G H, K L M, in Fig. 503, and in plan at Fig. 504. A good average size is from 6 feet 6 inches to 7 feet in length and 2 feet 3 inches in width. The double arrows at G and L, in Fig. 503, show the extent of overlap of the lower series of plates by the upper series. This is shown all the more clearly in Fig. 504, in which the overlapping, horizontally and vertically, is very plainly exhibited. All that need be said in explanation of the mode of fixing is, that they are held in place by screw bolts passing through the plates and into the purlins, and turned down sufficiently to clip the plates and hold them tight by means of a coach wrench. Two bolts are allowed to each plate at the lower part of the lower series, and two at the upper part at the overlap of the upper and lower series. At the top they are held in place by bolts which pass through the ridge pieces of iron capping, shown in section at H K in Fig. 503, and in plan in Fig. 504. These pieces are about

Corrugated iron plates for roof and roof-ridge.

6 feet long, and overlap at the joints. They are held in place by a bolt at each end, one of which—namely, that towards the left—passes through and holds down ridge plate and first roof plate of the upper series; the other, towards the left, passing through and holding down adjacent pieces of ridge plate at the overlap and the corrugated iron plate immediately below them. When the plates and capping at ridge are all in place and bolted down, the roof is complete. I may add that it is desirable to allow the plates to project as far as they can be conveniently brought forward, over the gables at each end and at the eaves, especially if there be no guttering or shoots to collect and carry the water into a down pipe.

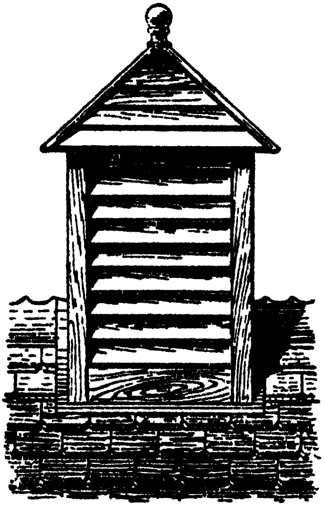


FIG. 505. Louvre—Front Elevation

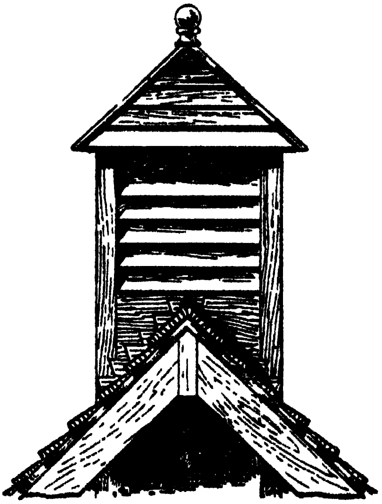


FIG. 506 Louvre—Side Elevation.

The louvre.

Construction and determination of dimensions.

869. I promised that I would describe the mode of making a louvre for ventilation; and this I will now proceed to do. The louvre is a turret-shaped structure, generally about 2 feet square, but varying greatly in size, according to the size and nature of the building over which it is placed. The home carpenter will easily gather its general appearance from Fig. 505, in which its front elevation is shown, and from Fig. 506, which exhibits its side elevation, and shows how it is placed in and over the roof of a building. Its construction, and the mode of fixing it in its place, are both simple enough, but a few words must first be said on the determination of its dimensions. If the roof on which it is to be placed is a newly made roof, of which the timbers only are in position, and the

battens on which tiles or slates are to hang by pegs nailed to the rafters, the job is easy enough; but if the roof is an old roof, or one that has been already finished and covered in, it will be found to be necessary to strip on both sides the ridge tiles and tiles or slates from the roof on which the louvre is to be placed. Now, supposing that the roof is that of a small building, and that the rafters are 21 inches apart, or that there is a width of 21 inches between each adjacent pair of rafters, it is evident that the louvre itself will be 21 inches square, because, when made of this size, it will be sufficiently large enough to admit of the thorough ventilation of the building by its agency. Another thing is self-evident, namely, that, if made of this size, it can be passed in *between* adjacent rafters, and the uprights screwed to their opposite faces, which will at once keep the louvre in position and place. Supposing it is desired to make a larger one, and that the rafters are 2½ inches wide, the louvre may be made of such a size that its uprights will pass over the pair of adjacent rafters, having the rafters *within* or *between* its uprights, which are screwed to the rafters as before. In this case, as the rafters are supposed to be 2½ inches wide, the louvre will be 31 inches square, and the distance between the uprights will be 26 inches, supposing the uprights to be 2½ inches square; whereas, on the first supposition of placing the louvre *between* adjacent rafters, it would have been 16 inches. Another plan is to make the louvre 26 inches square, which would give a width of 21 inches between the uprights, and then to cut the uprights of the louvre on a bevel corresponding to the slope of the rafters, and then to nail the uprights on to the rafters. But this mode would not be in any way so strong and stable as the other. Fig. 507 will clearly show what is meant above; for in this the three grades of size described above are shown on a scale of ⅛ inch to 1 inch. In this A A′ are the rafters; B B′ uprights of louvre passed between them and screwed to their inner and adjacent surfaces; C C′ uprights of louvre butted on to the upper surface of the rafters and nailed to them, after having been cut to a bevel corresponding to their slant or slope; and D D′ uprights of louvre standing without the rafters, so to speak, and butting against their outer and remote surfaces. The distances *between* the uprights of each grade are shown by the dotted lines and arrow

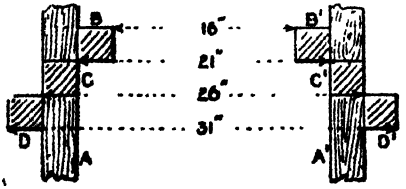


FIG. 507. Diagram showing Width of Three Grades of Louvres and their Measurement within and without.

heads. There is nothing like a diagram to make everything of this kind clear and apparent, as it prevents the writer from getting fogged in his figures when the brain is tired and almost refuses to answer the helm, and it helps the reader to comprehend the writer's meaning better and quicker by appealing diagramatically to his eye as well as verbally to his understanding.

Skeleton frame of louvre.

870. The construction of the louvre itself, as I have said, is easy enough. Four uprights of the required dimensions must be first taken and planed up on all sides, and these must be framed together at top and bottom in such a way as to form, so to speak, a skeleton box. The upper rails of the structure, which come just below the cap or roof, are visible in Figs. 505, 506, but the lower ones are hidden from view by the roof of the building, and must be mortised and tenoned into the uprights in different positions; the side rails in the side elevation, in Fig. 506, coming, as a matter of absolute necessity, *above* the ridge plate to which the rafters are nailed, and those in front and at back much lower down. In fact, in every case the position of rails in front and at back and sides must be regulated by the relation of the louvre to the rafters, as set forth and defined in the preceding section. Before the uprights and rails are put together, provision must be made in the uprights for the insertion of the louvre boards, by diagonal grooving, as shown in Fig. 508 at A. This grooving should be made at an angle of 45°, with the edges of the inner and adjacent sides of the four uprights. It need not be of any very great depth: from $\frac{1}{4}$ inch to $\frac{3}{8}$ inch is sufficient. The louvre boards themselves are shown in plan at B, and in end view at C. It will be found easier to push them into place from the outside, and then to keep everything secure and every board or slate in place: a piece of casing or lining should be nailed to each of the outer faces of the upright. This should be neatly finished on the edge next the louvre boards with a bead. It will be found easier, too, to paint the inner faces of the uprights and the rails and louvre boards before the latter are put in place. The grooves should all be of the same depth, and this may be easily managed with a router. They should be first marked out with a pencil or edge of a broken knife kept for this purpose. Then a tenon saw should be passed just within the marks—leaving the marks showing—and they should then be

Louvre boards.

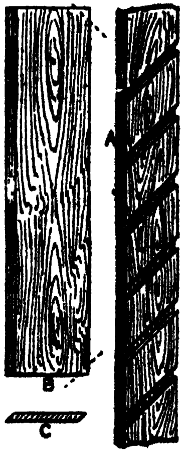


FIG. 508. Mode of Grooving Sides of Uprights and making Louvre Boards.

cleared, first with a sharp chisel and then finished with the router. It will be noted that, owing to the slant of the louvre boards outwards and downwards at an angle of 45°, it is impossible for any rain, however driving and however much aslant it may be, to find an entrance. The louvre boards may be made a little less in width than the length of the groove, unless the upper corners in each board be just chiselled off, as shown by dotted lines in B. The inner and outer edges of the louvre boards should be bevelled off at an angle of 45°. The cap or roof is made independently on a separate framing, and nailed on when finished. It is pyramidal in shape, and is made of feather-edged boards, or boards with the upper edges planed down to next to nothing, capped at the joints, and finished with a turned ball and support. When in place the exterior of the louvre should have three coats of good paint. The junction of the louvre with the roof should be protected with a metal flashing.

871. From the louvre we must pass on to a good form of external staircase, which is useful as providing a means of access to a loft from without. Of course there are many modes of doing this; but I give the staircase shown in plan in Fig. 509, in front elevation in Fig. 510, and in side or end elevation in Fig. 511, because it shows how access by means of steps or stairs may be changed from one direction to another, an alteration in approach of which the home carpenter may wish to avail himself at some time or other. It is taken from an actual staircase, and is by no means to be regarded as being based on supposition, as so many things in this volume are and inevitably must be. The staircase in question gives access to a loft over the harness-room, attached to the stable of one of the many houses in which I have lived. With regard to position and circumstances of place, I may say that it is built in a corner formed by the meeting, at right angles, of two walls, one of which is the gabled front of the annex to the stable, and the other the back of a large lean-to cool vinery. The wall is indicated in the plan in Fig. 509 by the sectional shading on the top of this diagram and to the right of it This and Figs. 510 and 511 are drawn on a scale of ¼ inch to 1 foot.

External staircase.

With regard to external staircases, they vary in form from the simple ladder and ordinary flight of steps, made by grooving two diagonal boards of the necessary width to receive the treaders, due regard being paid to the inclination of the side pieces, or "string-boards," in which the grooves or "housings" of the steps or treads are cut. In a ladder it will be noticed that the inclination of the sides makes no difference in the mode of ascent, though the feet will rest on different parts of the staves, according

Variation in form.

to the greater or less inclination of the ladder to the wall or any other object against which it is placed. With stairs or steps, however, it is altogether different; for it is essential to the safety and security of those who use them that the treads should always be level and perfectly horizontal, so it is easily seen and recognised that the grooves in the string-boards will vary in the angle they make with the edges of the latter in proportion to their inclination. Thus it would be useless to make the angle of the treads with the string-boards a right angle, and impossible to place them in a position parallel with the edges of the latter. It will be found in practice that the treads will vary in inclination to the string-boards from 30° to 60°, and that for all ordinary purposes an angle of 45° will be found the most convenient, as the home carpenter may find for himself by working the matter out on paper—the best and safest way of dealing by way of preliminaries with all matters connected with carpentry, joinery, and all constructive processes in building.

Dimensions of materials for external staircase.

872. The materials used in the construction of the external staircase now under consideration, were timbers used for posts, or uprights, which were 3 inches square; pieces used as rails, which were 2 inches by 4 inches; timbers used as joists, which were 7 inches in depth by 2 inches in width; pieces for the treads of the stairs, which were also 7 inches by 2 inches, although 1½ inches would have been, and is, sufficient for the thickness of these; and battens for the landings, which were 2 inches in width and 1 inch thick, and were placed across the joists at an intervening distance of 1 inch from side to side, giving sufficient means and opportunity for the escape of the rain that falls on them. They were, however, showing signs of decay when they came under my care and keeping *pro tem.* It is useless to paint landings and treads, but if I were making a staircase of this kind for myself, I should be inclined to try what a yearly dressing of Stockholm tar would do for their preservation, or even a dressing of gas tar, well sprinkled with sand immediately after application, and renewed from year to year. The worst of gas tar is that it gives to a hot sun; but when covered with sand the inconvenience arising from its giving would not be so much felt, and would be assuredly reduced to a minimum, a thing much to be desired.

873. The diagrams given in Figs. 509, 510, and 511 will show how these materials were utilised and put together. In these I have departed in some measure from the actual construction of the stairs. I have given the staircase in plan in Fig. 509, exactly as it is in the actual staircase; but as it is possible

Inclination or slope of steps and stairs.

that it may be convenient to erect in a position other than in a corner formed by the meeting of two walls rectangularly, and possibly almost entirely independent of support against a wall, I have shown in Figs. 510 and 511 how it may be made firm and stable by the use of posts, or uprights, only the weight of the platform which forms the topmost landing immediately in front of the door of the loft to which it gives access is thrown on two struts 3 inches square, which butt at the lower end against the stout sill of a window immediately under the door of the loft, save for the intervention of a deep flat arch in brick, and at the upper end under and against the joists, which are shown at B and C, as entering into the posts, or uprights, in section, and thus lettered in Fig. 509. The position of these struts is shown by the dotted diagonal lines in Fig. 511. I have used, as far as I can, the same lettering to show parts that are identical in each diagram. The posts B and C in the actual staircase ended at the places indicated by the arrows X and Y;

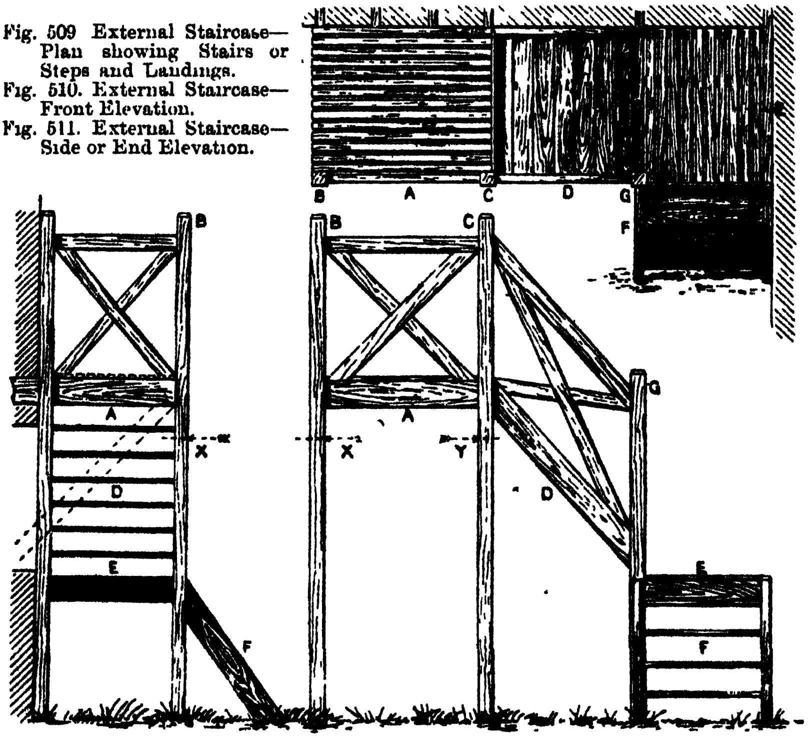


Fig. 509.

Fig. 509 External Staircase—Plan showing Stairs or Steps and Landings.
Fig. 510. External Staircase—Front Elevation.
Fig. 511. External Staircase—Side or End Elevation.

Fig. 511.

Fig. 510.

and although the platform at A was perfectly stable and secure, yet it had an aspect of being suspended in the air, like Mahomet's coffin, which, if I remember rightly, is said to hold that position in some mosque dear to hadjis or pilgrims of that persuasion, in one or other of the sacred cities—Mecca or Medina.

Dimensions of staircase.

874. The following were the dimensions of the staircase according to measurement. The space occupied or covered in plan by the platform at A was 3 feet 9 inches in length by 3 feet 2 inches in width, and that covered by the stair at D, also in plan, was 2 feet 11 inches in length by 3 feet 2 inches in width. These were very steep, as shown by the inclination of the string-board in Fig. 510; so steep, indeed, that in the seven treads of which the staircase was composed, and which were 7 inches wide, the inner part of each stair passed for some little distance under the front edge of the stair above it, and thus made ascent and descent thereby more difficult by far than it would have been if the inclination had been less steep, so as to admit of each stair being clear of the one above it, and that which was immediately below it. The landing or platform at E was 2 feet 10 inches in length, taking the length along the wall in continuation of the topmost landing and stairs. Its width was 3 feet 3 inches; but this excess over the other parts that in plan are apparently in the same plane is due to the fact that nothing in the form of joist or string-board intervened between its outermost edge and the four stairs at F, which in plan covered a space of 2 feet 10 inches in width by 2 feet in length. This part of the stair was far easier to mount or to descend than the steeper portion at D.

Construction of staircase.

875. The whole structure was very strongly framed together. The platform or landing at A consisted of four joists, which, at their inner ends, were let into and supported by the wall. The ends of the outer joists were let into the posts B and C, the ends of the two intermediate joists being let into another piece of joist at right angles to them, the outer ends being framed into it. The ends of this piece of joist also were let into the posts B and C. There is no occasion to describe the manner in which the framing was effected, as this will be, or ought to be, well understood by the home carpenter by this time, and to go through it again would be but useless repetition. Passing on to the staircase at D, the upper end of the inner string-board butted against the joist that ran from the wall to the post C, against which the upper end of the outer string-board also butted and entered. The lower end of the inner string-board butted against the joist that ran from the

wall to the post G, against which the outer string-board also butted and entered. This post, according to measurement on the spot, was 7 feet 3 inches in height, but in Fig. 510 it is less than this. I think this excess in length was due to inequality of the surface, which was somewhat lower here than at the posts B and C. The first landing at E was formed of the joist that ran from the wall to the post G, and four joists at right angles to it that were framed into it at one end—the outer end—and entered the wall at the inner ends. Across these, battens were laid, as in the topmost landing. The stairs at F were made independently, and the upper ends of the string-boards butted, one against the post G, and the other against the inner end of the outermost joist in this piece of framing just where it entered the wall. The lower ends rested on a log of wood that had been lodged in the ground to receive them, and which, owing to the damp, was rapidly going to decay. Had the staircase been independent of any wall, there would of necessity have been posts opposite those at B, C, and G, with two others at the corner of the first landing, and the joists running from that between the wall and the post G, and entering the wall, shown in section, in a slight degree at E in Fig. 509, would have been framed into a piece of joist running parallel to the wall at E, from the additional inner post to the additional outer post on the outer side of the first landing. The home carpenter will see at a glance that the external staircase that has just been described can be varied so as to suit any circumstances of place or position, when treated as an independent structure. Thus the stairs at D might be carried onwards to the ground if the platform at E and the stair at F were removed, and there was no wall at E. Further, the stairs at F might be put on either side of the platform, or landing, at E, or even where the wall at E is, but there would be no advantage in doing this; and by extension of the platform at E in either direction, the stairs at F might be returned on either side of the stairs at D. I mention this to show the home carpenter how easily external staircases can be adapted to the requirements of place and position.

Butter boxes.

876. The last things to be mentioned here as collateral subjects indirectly connected with cow-keeping and cowhouses, are butter boxes and butter prints. Butter boxes for the transmission of butter from place to place can be taken up and dismissed without a diagram, and in a few descriptive sentences only. They are simply and easily made, but the shape must depend very much upon that of the butter they are intended to carry, that is to say, on whether the butter is made up into rolls or oblong but almost rectangular lumps of ½ lb., or 1 lb. each, or into round lumps, or pats, of

similar weight. First of all, a box must be made in the usual way, just the depth that accords with the length of the pieces of butter that are to be transmitted therein. The box must be divided within into as many compartments as may be necessary : it may be suited, in fact, to carry one, two, three, four, or five pats, or long rolls of butter, as may be required ; but it must be borne in mind that uneven numbers, such as three and five pats, must be contained in long boxes, in which the compartments form a single row, whereas in numbers divisible by 2, butter may be disposed in double compartments, and in treble compartments in numbers divisible by 3. Hence, seven, eleven, and thirteen are inconvenient numbers to deal with, and five is the highest odd number, being a prime number, that is to say, a number that cannot be divided by any number except itself, that should be dealt with. With regard to securing the box so as to ensure safe transmission, and to prevent any removal of, or tampering with, the butter, the lid should be made with ledges to fit over the box, to the depth of 1 inch below the inner surface of the lid, which will have the effect of rendering the box dust-proof. The butter should be wrapped in wet muslin cloths before the lid is put on. The ledges, by the way, can only be put round the front and sides of the lid ; for the back of the lid, so to speak, should be hinged to the box, and, if thought necessary, a piece of leather neatly tacked over the joint between box and lid, so as to hide both joint and hinges. A slot should be made in the front of the lid to allow of its fitting on to and over a staple in front of the box, through the edge of which a padlock should be passed. When butter is transmitted regularly, the sender, and the person to whom it is sent, would each have a key by which the padlock could be unlocked. A handle of metal, or leather, should be fastened to the *front* of the box, so that when the lid is closed and the padlock secured, the butter may be carried in the direction of its length, and thus saved from having its weight thrown entirely on one end, which is undesirable, especially in hot weather.

How to fasten lid.

Butter prints.

877. Butter printing is effected in two different ways. One consists of stamping a round pat, already made, with a stamp such as is shown in Fig. 512, which produces a very pretty effect, or Fig. 513, or with a square stamp, as it may be if the butter is made up in a rectangular form ; and, perhaps, the home carpenter will find it easier to make a square stamp than a round one. Another way is to make up the butter in the form of rolls, and round the surface by passing a runner over it, which should be of the same width as the roll, or by rolling the butter over a flat surface on which is engraved the design that it is desired to take. All printers intended to

stamp butter should be made of hard close-grained wood, such as boxwood, apple or pear wood, beech, and even willow, if the tools used be sharp, as they should be. The round print is usually made with a handle at the back, rising vertically from its centre. The runner is drilled through the centre longitudinally, and is worked by a handle having two stout wires proceeding from it, which are bent in such a way that the points enter the ends of the runner and combine, so to speak, to form an axle upon which it runs. Patterns of straight lines, diagonal lines, or even like that shown in Fig. 512, can be worked on a runner. The sizes will, of course, vary with the size and weight of the pieces of butter to be stamped. Prints for pats of 1 and 2 ounces will, of course, be small, but those for ¼ lbs., ½ lbs., and pounds will be much larger.

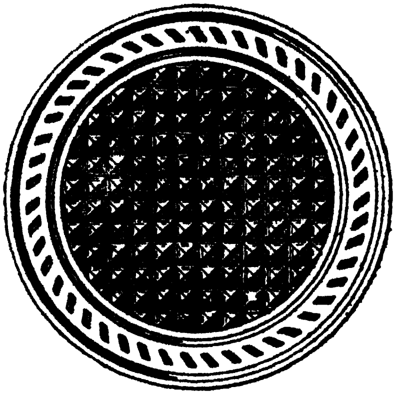


FIG. 512. Butter Print of simple character produced by V-Chisel.

878. If the home carpenter can turn and possesses a lathe, he can easily prepare a plain round stamp for ornamentation, and if there is an overhead the lathe, and he can do a little ornamental turning, he can produce a variety of patterns, which are impossible to the ordinary home carpenter. Those who carve in wood also will have no difficulty in producing patterns of all kinds in *intaglio*, or depressed cutting on the wood, which will appear in relief on the butter when stamped. Perhaps both the carver, unless he be able to turn as well, and the home carver had better go to a shop where turnery is sold, and try to get a few plain stamps, or printers, on which to try his hand. The design shown in Fig. 512, although it looks complex in itself, is, in reality, simple enough. The design in the centre is produced by running a V-chisel over the surface, first in a series of parallel grooves across the block, and then by cutting another series across the first

Mode of making butter prints in plain wood.

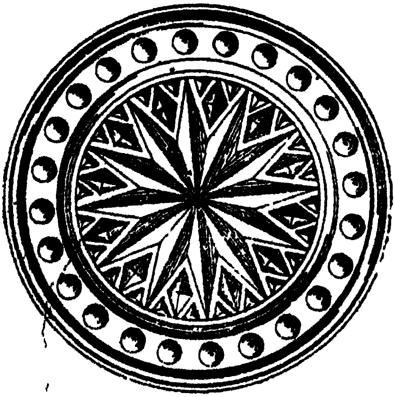


FIG. 513. Ornamental Butter Print in style of Chip Carving.

series at right angles to it, and similar to it in width and depth of cut. It requires great care in execution, and the home carpenter should try his hand with the V-chisel on plain surfaces of hard wood before attempting the work on a properly turned print. The design should be carefully spaced and ruled on the wood with a hard pencil, and the circular grooves, the ornamentation between them, and the boundary of the central design clearly defined with compasses, carrying a hard pencil in the pencil leg. A bit of card, or semi-transparent horn, should be placed over the centre to prevent injury to the wood from the point of the compasses placed in the centre of the circles. The design in Fig. 513 is simply marked out and the depressions cut with chip carving tools, in the manner of chip carving, as far as the central star and pyramids, etc , are concerned. The circles in both designs and the circular depressions round the margin in Fig. 513, may be done with a fine gouge, if care be used. There are countless designs in existence which may be adapted very readily for work of this kind ; and as skill in the work is acquired, as it may be by any one who has a fancy for this work, and perhaps has a mind as well as opportunity to turn it to good account, crests, armorial bearings, monograms, etc., may be appropriately cut in the centre, with a pattern round the edge, or motto to accompany the crest, or any other lettering, or form of words that may suggest itself.

Mode of cutting prints.

879. It is possible that in a chapter devoted to the cow, a few words may as well be added relative to appliances for sheep and goats ; but much information on the few and simple appliances required for sheep in the open field were taken up in the first chapter, and treated as far as was necessary there. Every kind of feeding appliance used in the yard or in the open field for cattle will do well enough for sheep, but they must be of a height suitable for them.

Appliances for sheep.

880. Goats require no shelter at night, but are generally brought into a shed or some enclosure, rather to guard against appropriation of the animals by some one who has not the slightest right to them, than to protect them against the weather. The chief anxiety of those who keep goats should be to see that they are safely and securely tethered by day. Round its neck should be placed a stout, but not too broad, collar of leather, with a brass loop attached to it, like a dog collar, and a fairly light, but strong, steel chain should be connected with this by a swivel hook. It is desirable to have two or more

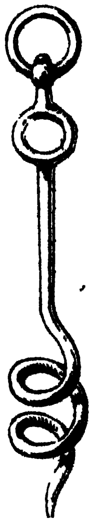


FIG. 514. Useful Form of Tethering Peg.

Means and mode of tethering goats.

swivels in the chain to prevent kinking. The free end should also be furnished with a ring, through which a stake of iron, with a head large enough to prevent it from passing through the ring, should be driven, or it may be furnished with a swivel hook large enough to hook into the ring of the "patent tethering peg," shown in Fig. 514, which may be used with advantage in any soft ground, from which a stake might be drawn with comparative ease, but from which the patent tethering peg could not be extracted, let the goat pull as hard as it may, as it is shaped like a corkscrew at the bottom, which gives it a firm grip of the ground. The loop below the ring serves to take a stake or bar of small size which is used to turn the tethering peg into the ground to a sufficient depth, and to withdraw it therefrom when necessary. These tethering pegs are made in nine sizes, or rather in nine degrees of form and strength, for in reality there are three sorts —one with a bow top, another with a swivel top, and a third with a swivel ball. Each class has three kinds of peg, defined as "light," "strong," and "extra strong". They are made in black iron and galvanised iron, and pegs of the first class are supplied in black iron at 9d., 1s., and 1s 3d., and in galvanised iron at an advance of 3d. in each case. This, I think, is all that I really need say about the goat, which, if "safe bound" will be "safe found" when wanted by its owner.

CHAPTER VII.

HOUSES: APPARATUS AND APPLIANCES OF VARIOUS KINDS FOR POULTRY IN GENERAL AND FOWLS IN PARTICULAR.

Arrangement of Subject Matter—Appliances for Poultry-Keeping to be described, and not Poultry-keeping itself—My First Hatching Box—Materials, Dimensions, and Construction—First Stage of Construction—Second Stage of Construction—Lids at Top—Construction of Gate-doors—Improvements in Construction of Hatching Box—Sliding Gates—Improvement in Construction of Bottom of Hatching Box—Shelter for Hatching Boxes—Coops for Hens and Chickens—Coops for Hens and Chickens: the A Form—Alternative and Better Form of Coop—Front of Alternative Coop—Wired Panels for Runs to Coops—Double Coop with Run for Hen and Young Chickens—Construction and Dimensions—Central Division—Ridge Piece—Entrances and Shutters to Coops and Runs—Single Coop with Wire Run attached—Construction and Dimensions of Side Panels—Lower End of Wire Run with Transverse Bars—Lower End of Wire Run with Vertical Bars—Top, or Lid, of Wire Run—Front of Closed Coop—Fitting Run together, and its Junction with Coop—Feeding Coop for Young Poultry—Construction of Feeding Coop—Useful Method of Jointing Posts and Rails—Construction of Jointing—Wire Rails—Laying Boxes for Fowls—Plan of Laying Box—Front and Side Elevation of Laying Box—Nosing at Top and Bottom—Top of Hatching Box—Construction of Carrier, or Stand, for Eggs—The Sliding Shelves—Three-ply Wood—How to Cut Holes in Shelf—Trays in Box Form as Alternative for Egg Carrier—Flat or box-like Tray as Alternative to Carrier—Sloping of Tray as Alternative to Carrier—Pen for Fattening Poultry for Market—Construction of Bottom of Pen—The False Bottom—Feeding Trough—Crates for Transmission of Poultry from Place to Place—Dimensions of Crates and its Parts—Construction of Crates—Movable Poultry House—Construction of Movable Poultry House: the Framing—The Bottom: Construction of Drawers—Interior of the House at Back—Interior of the House at Side—Front of Movable Poultry House—Requirements of Turkeys—Turkey or Fowl Ladder—Adaptation of Cow Sheds for Fowl Houses.

Arrangement of subject matter.

881. I HAVE now done with everything that the home carpenter may hope to accomplish for quadrupeds in his farmstead, and I must now turn his attention and mine to those things that he may require and make with his own hands for his poultry, if he goes in for poultry-keeping. Looking at the requirements of fowl life, and to what the poultry keeper requires, the appliances that have to be described, and the order in which they must be taken will be (1) hatching boxes; (2) coops for poultry and young chickens; (3) feeding crates for young chickens; (4) laying boxes; (5) crates for sending live stock from place to place; (6) fattening boxes. These done with, it will yet be necessary to deal with houses for poultry of various kinds, and, lastly, with collateral appliances of various kinds desirable in poultry-keeping,

of which the egg stand for the reception of eggs day by day, so as to show the poultry keeper the age of the eggs, and the sequence in which the eggs have been laid from day to day, and egg boxes for the transmission of eggs, may be taken as specimens.

882. Here, then, are a great many distinct and separate subjects with which it is necessary to deal, and dealt with they must be, and in the order laid down for the guidance of the home carpenter and myself above. It will be understood that the mode of making appliances for poultry-keeping only is to be taken up here, and that no allusion will be made to—at all events, no description given or even attempted of—the various breeds of poultry; and everything for whose manufacture instructions will be given, will be some appliances for poultry-keeping that I have made for myself, or could make, if necessary, if I have not yet made it. Everything will be plain, neat, and calculated to do good service. Let me, then, introduce the reader at once to the hatching box I have mentioned, and which, so to speak, was evolved out of nothing, that is to say, of material which had no value, and which is generally broken up for fire wood.

Appliances for poultry-keeping to be described, and not poultry-keeping itself.

883. Those who follow me in the construction of this hatching box will readily see how they may make it out of perfectly new timber, if they desire to do so. Our hens had been sitting about in coach-house and stable in groups. They were disturbed, it is true, by the outside world; but when two or three chose to come off their eggs for the purpose of taking in necessary refreshment in the form of corn and water, and stretching their legs, there was a possibility of every hen that was off her nest hankering after, and making for one and the same set of eggs—the disappointed ones deliberately settling down in close proximity to the hen that had secured the coveted sitting, and allowing the neglected eggs to cool for a longer time than they ought, and if not caught in the act soon enough, to lose the principle of life that the natural warmth of the hen had called into activity, and become useless. It was necessary to guard against this sort of thing, but my stock of wood had run very low, and some little time must of necessity elapse before I could get a fresh supply. In this emergency my eyes lighted upon some boxes—cube sugar boxes they were—so I determined to go to work without any further delay and turn two of them into those nest boxes.

My first hatching box.

884. The home carpenter will see an illustration of this impromptu hatching box in Fig. 515, but in this he will find no trace whatever of its origin. My first care was to remove the front of each, and to take out the

Materials, dimensions, and construction.

adjacent sides of the two boxes when brought into close proximity, that is to say, the left-hand side or end of the box that stood on the right, and the right-hand side or end of the box that stood on the left. I then got some battens, 2 inches wide and ¾ inch thick, and with these I proceeded to make the two boxes into a single box, divided into three compartments, each of sufficient size for a sitting hen, although an inch or two more width, depth, and height would have been desirable. But this can be easily provided for by the home carpenter who makes nest boxes on my principle out of new wood instead of old boxes. When the two boxes had

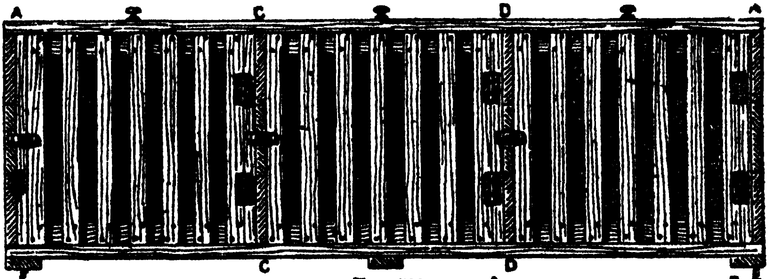


FIG. 515

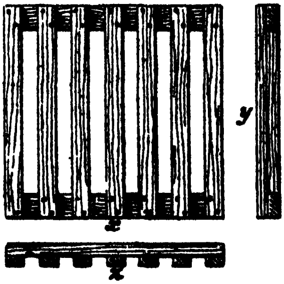


FIG. 518.

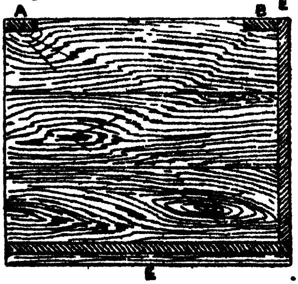


FIG. 516.

FIG 517.

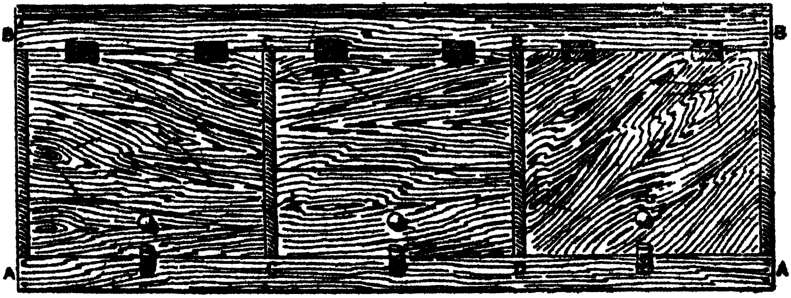


Fig. 515 Hatching Box for Fowls—Front Elevation Fig 516 Side or End Elevation. Fig 517 Plan of Top as seen from above Fig 518 Diagram showing Construction of Gate or Open Door to Compartments in Elevation at *x*, in End or Side View at *y*, and in Plan at *z*

been brought together edge to edge of back and bottom, I found that they formed one box, 3 feet 10½ inches long, 17½ inches wide, and 14½ inches high, as shown in the accompanying working drawings given in Figs. 515, 516, 517, and 518. As these are genuine working drawings given to enable the home carpenter to follow in my footsteps with regard to the utilisation of old boxes, if he wishes to do so, they are drawn on a scale of 1 inch to 1 foot, and being of this size, they are one-twelfth the actual size.

First stage of construction.

885. My first task was to connect the two boxes, and, at the same time, to give as much strength and solidity to the structure as I could in the earliest stage of making, so I took the two battens that I had cut, and after rubbing them over with a jack plane to take off part, if not all, the rough exterior, I cut notches in the two ends, as shown at A and B in Fig. 516, and in these notches I laid the battens A A and B B, as shown in plan of top in Fig. 517. I then took the boards that formed the ends of the original boxes that I had previously removed, and having put them firmly together by dowel pins formed by nipping off the heads of wire nails, I cut notches in these, as in the ends, in order to utilise them as partitions between the three compartments, into which I wished to divide the box. These partitions are shown at C C and D D in Figs. 515 and 517. In order to determine their position with precision, as the ends of the boxes were ¾ inch in thickness, I took their aggregate thickness, namely, 3 inches, from the length of the box, which was 46½ inches, and divided the remainder, namely, 43½ inches, by 3. This gave 14½ inches as the width of each compartment, and when I had measured off this length from the inner face of each end along the battens and the front edge of the bottom of the box, I knew exactly where to place the partitions, leaving 14½ inches intervening between them. I had cut notches in the partitions in the same manner as in the ends, or as at A and B, in Fig. 516. I had run in lines with a square on the bottom of the box to show exactly where I had to place slips, and had lightly nailed them along the lines ½ inch square for the partitions to butt against. I soon got them into place, and when I found by measuring that every part was fair and square, I nailed down the battens on the ends and partitions at top, and then proceeded to nail the top of the back, as shown in Fig. 517, to the outer edge of the batten B.

886. It was somewhat surprising to find how strong the connected boxes were now, and how well the entire fabric would bear handling; but I made it stronger and firmer still by putting the pieces of batten, shown at E, E, E, in Figs. 515 and 516, transversely across the bottom of

the box in the positions shown, and I strengthened the edges of the ends and partitions in front by screwing slips ¼ inch thick or thereabouts to the *right* side of that shown at A, on the left in Fig. 515 and to the *left* side of those at C, D, and A on the right. These slips will be easily recognised, as they are those to which the hinges of the gate-doors are attached, and the button which fastens the gate-door on the left. The carcase of the hatching box was now complete, and all I had to do was to close up the openings at the top with solid lids, as shown in Fig. 517, and to make open doors for the front. The lids gave me but very little trouble, as I happened to have some very wide boards—about 14 inches wide, in fact—that cut up very nicely for them. I was obliged to make the central lid of two narrower pieces, as shown, but these I dowelled together and strengthened by slips screwed across on the under side. I had to nail slips to the ends and partitions, and screw pieces to the under side of the batten A A as stops for the lids, and I then attached them with hinges to the batten B B, as shown, and fitted each with an iron knob with which to raise it when necessary, and screwed buttons to A A wherewith to keep the lids fastened down in place. And thus the top was finished.

Second stage of construction.

Lids at top.

887. Nothing now remained but to fit the front with what I have called gate-doors, through which to let the sitting hens in and out of the hatching boxes, when it was necessary for them to feed. As these were made in haste, on a rough and ready principle, I have shown their construction in Fig. 518, thinking that the mode of making is well worth the attention of the home carpenter. Firstly, I took two pieces 1¼ inches thick to serve as uprights, or styles, and two pieces 1½ inches wide and ¼ inch thick to serve as rails at top and bottom. I notched the styles at the back to receive the rails, and then, having proved them to be truly square, I screwed the four pieces firmly together at the corners. I have said nothing about width and height, as such was made to measure to fit the entrance to the compartment to which it belonged. There was no difference in size between those that closed the compartments between C and D, and D and A, but that between A and C was a little less in width, as will be found on measuring them in Fig. 515. This done, I spaced out the rails into eleven equal parts, and put on five laths to each door, about 1 inch in width and ½ inch thick. They were then hung in their places by hinges, as shown, and secured by buttons. The front elevation of the gate-door is shown a *x*, in Fig. 518, the end, or side view, showing how the rails were notched into the styles at *y*, and the plan showing how the intermediate uprights were laid on the rails and nailed down

Construction of gate-doors.

to them. Properly the rails should have been similar to the styles in thickness, if not in width, and the laths notched into them, or holes corresponding in position bored in the rails at top and bottom for the insertion of bars of iron wire about ⅛ inch in diameter; but, as I have said, the hatching box was wanted in a hurry, and I had no time to spend in nicety and neatness of construction.

Improvements in construction of hatching box.

888. Nevertheless, as soon as I had completed my first hatching box, which was placed in a coach-house with a concrete floor, I began to see how I might have done better. In the first place, it would have been far more convenient and far easier to have made the gates in front to slide up and down, than to have hung them on hinges, as they were; and in later construction of hatching boxes I always followed this plan and principle. The mode of accomplishing this is shown in Fig. 519. In this A A is the batten, so designated in the preceding figures, broken away where it is notched into the partition D, to show the method of making a groove for the slide. I have supposed that we are fitting a hatching box, as made from diagram in Figs. 515, 516 and 517, with sliding gates. The first thing to be done will be to nail a slip F to the edge of the partition D, and another slip on the face of this, but three times as wide as shown at G. A groove is thus formed, up and down which the rails K K and the uprights L L, made as shown in Fig. 520, slide. The rail K runs right along and forms the entire top, and a piece of the same thickness is screwed to the back of L, so that a flange or tongue may be formed which works in the groove from top to bottom. The uprights may be made in two pieces, L and M, as shown in Fig. 520, the upright piece at M being shortened at top and bottom to allow the rail K to be dropped into place and screwed to L, or the piece M L may be made in the solid and rebated to enter the groove; it must, however, be similarly notched at the top to receive the rail K, whose position is indicated by dotted lines.

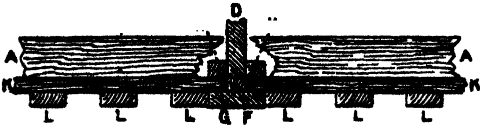


FIG. 519 Diagram showing Mode of Closing Front of Hatching Boxes with Sliding Doors

Sliding gates.

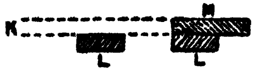


FIG. 520. Sectional Diagram showing Construction of Side of Slide.

889. I had, however, thought of a far greater improvement than this in the construction of the bottom of the hatching box, which I will now describe to the reader. I found in the hatching box as made above, that, although the bottom of each compartment was littered with straw, the hens therein

did not keep their eggs comfortably together; in fact, that the bottom was too flat and too much in the form of an actual wooden floor in a room. Again, I found it was a mistake to keep the hens in a coach-house floored with concrete; for, although the box did not wholly rest on, and come in contact with, the cold concrete, being raised above it by the battens which run transversely across the bottom, the concrete could not fail to exercise a chilling influence on the eggs, however slight it may have been, and, as the hens were fed within four walls, and were not at liberty to go along grass or hedges in quest of food, it could not get that moisture on the feathers of its breast and body which is so necessary to give the requisite dampness to the eggs that are being hatched. To counteract this I determined to place the hatching boxes in the open air on turf, but under cover to keep them from the weather, and so allow the hens to feed in the open, and to have the air, light, and warmth from the sun's rays which they could not get when immured within four walls. Further, I resolved to make provision for placing the eggs on turf or soil, as the hen herself would have placed them if she had been allowed to steal her nest. All I did was to attach a lining to the bottom of the box between the transverse battens, about ½ inch in thickness, putting the boards of which it was composed in a direction transverse to those of the original bottom. I screwed them well together, taking care to keep clear of the circular hole I was about to cut in the bottom, as shown in Fig. 521. Then I cut the hole with a compass saw, as shown by the inner circle, and then took off the top arris with a spokeshave until it assumed the shelving form as drawn. The two layers that now jointly formed the bottom are plainly shown in the diagram, which is on the same scale as Figs. 515 to 518. I obtained many advantages by the alteration. In the first place, the hen was better enabled to keep her eggs together than she was when the bottom was perfectly flat throughout, and, secondly, both the hen and the eggs were able to receive and retain the amount of moisture which they have when laid and hatched in the natural way. Thirdly, the hen itself, although under restraint, was in a far better and more healthy position than it had been when in the coach-house.

Improvement in construction of bottom of hatching box.

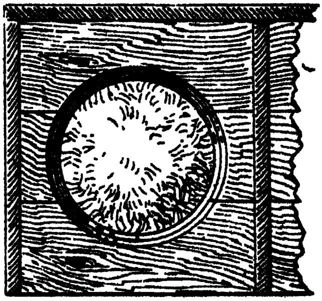


Fig. 521. Alteration in Bottom of Box.

890. These advantages, however, had their *per contra* in the flat top of the hatching boxes, which, owing to its construction was incapable of keeping

out the weather. Had I made them with a weather-boarded top sloping from the front, or even with a top on which the boards were vertical in position, or lengthways from front to back, and had slips nailed over the joints, the hatching boxes would have been weatherproof; but, as they were flat, it was necessary to protect them in some way. I did this by making a low shelter for them. This took the form of a miniature shed, higher behind than in front. Its form is shown in Fig. 522. The roof could be lifted and could be thrown back on its hinges so that the slides in front and the lids of the compartments could be lifted at pleasure and with ease. The front was high enough to allow the hatching boxes to be pushed in and drawn out when necessary without any trouble, and it projected sufficiently far beyond the front of the hatching boxes to keep off any driving rain that might come from the aspect towards which the hatching boxes fronted. The roofing of the shed was prevented from falling back on the batten to which it was hinged by a fillet nailed on the outer edge of the batten and rounded at top by running a plane along the upper arrises. Many readers will, doubtless, say that I might have saved myself much labour, time, and material by having fitted the hatching boxes themselves with sloping roofs instead of flat ones. I admit this; but, as it was necessary to be able to open the lid of each compartment without lifting the other, I venture to think my plan, or rather the plan that I adopted and followed, was the best after all. I should say that Fig. 522 represents the interior of the left-hand end of the shelter. I first made suitable framing for the shed with posts, or uprights, and rails of quartering 2¼ inches by 2 inches. I then boarded the sides and back of the framing, and made the roof all in one piece. I used boards placed vertically for sides, back, and roof, covering up the joints with slips or fillets nailed over them.

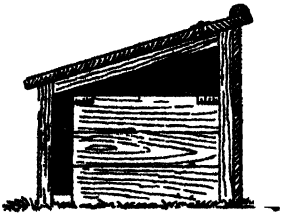


FIG. 522. Shelter for Hatching Boxes.

Shelter for hatching boxes.

891. Of course, there are many forms of hatching boxes, but the form I have described will be sufficient to put the home carpenter on the track of others; and I must go now to the consideration of the coops, which are the next things wanted, in point of order, for hens with broods of chickens. The stereotyped form of the coop for a hen and her newly-hatched brood will be found in Fig. 523, and, I daresay, there are but very few poultry yards kept by amateur poultry farmers in which this form does not predominate. For distinction's sake we may call it the **A** form, for it is fashioned very much in the shape of the first letter of the alphabet,

Coops for hens and chickens.

Coops for hens and chickens the A form.

the only difference being that the sloping back has a much greater incline than the sloping front, which is far more upright. Its construction is extremely simple, as may be seen from the illustration. Two ends, or sides, of triangular shape are first made of boards placed laterally, as shown, and dowelled together by wire nails, with the heads nipped off, and strengthened by slips nailed all round them on the inside, the outer edges of the slips being flush with the edges of the boards. Parallelism and vertical position of the sides having been secured by nailing temporary fillets to them, the back is first boarded over, and 2-inch battens, $\frac{3}{4}$ inch in thickness, are nailed in lateral position in the front. The hen is kept in durance vile in this until such time as she may be permitted to go at large with her brood by day, the chickens, on the contrary, have their liberty, and can enter or quit the coop at pleasure, finding means of ingress and egress between the first and second bars, counting from the bottom.

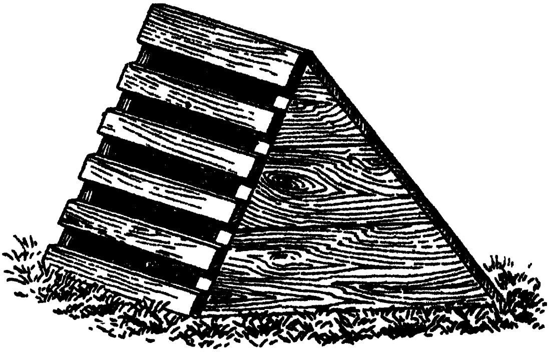


FIG. 523 Ordinary Coop of A Pattern for Hen and Chickens

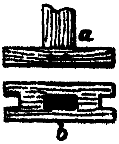


FIG. 526. Sliding Bar in Elevation (*a*) and Plan (*b*).

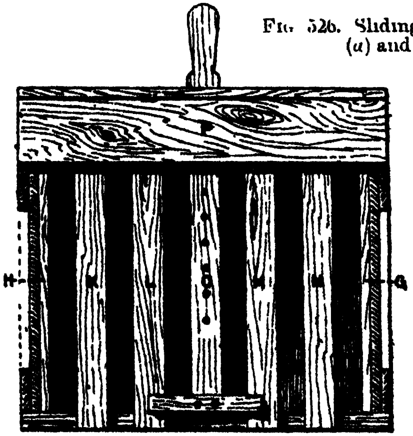


FIG. 524 Alternative Coop—Front Elevation

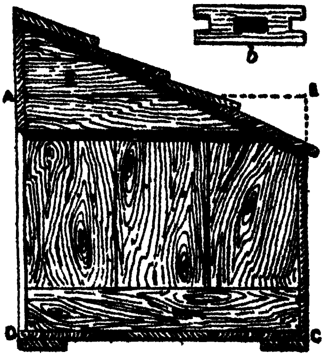


FIG. 525. End Elevation.

892. I did not care about this particular form, as, by the construction of the front, it was too much exposed to the weather, so I proceeded to make

Alternative and better form of coop.

mine on another plan, which I will now illustrate and describe for the information of the home carpenter. I never buy or use entirely new wood for appliances of this kind, and, as I had many boxes of one kind or another close at hand, I pressed these into the service. The end of one of these boxes in its original condition is shown at A B C D in Fig. 525. It will be noticed that one of the corners, at B, is defined by dotted lines. My first care was to divide the upper edge of each end or side into two equal parts, and then cut off the upper corners to the right, defining the saw cut by a line drawn from the point of bisection to another, taken a little way down the back. Having done this, I inverted the piece that I had cut off, as shown at E, and dowelled them together, filling up the corner with a small triangular piece of wood cut for the purpose, as shown at F. Thus, I had made provision for a slanting roof with as little trouble as possible, and, as back, sides, and bottom were now complete, I had only to supply a roof, which I did by nailing on a few thin pieces of board feather-edge fashion. Further, in order to strengthen the structure, and keep the bottom off the ground as much as possible, I nailed battens all along the edges of the bottom at front and back, as shown at C and D, and two pieces, ¾ inch thick, flush with the outer edge of each side on the inside, as shown at G and H. There was nothing else now to be done to the coop but to furnish it with a front.

Front of alternative coop.

893. This, like the adaptation of the box itself to the purpose required, was a matter of no difficulty. Having found that the distance from batten to batten across the opening of the interior was 19 inches, I found that if I used battens 2 inches in width and five in number there would be six openings with an aggregate width of 9 inches, which would give 1½ inches to each opening. Accordingly, I made the battens, and having marked out the spacing with rule, square, and pencil, I nailed four of them, as shown at K, L, M, N, to the outside of the front edge of the bottom, and the tops to another piece of batten which ran transversely from side to side just under the front edge of the roof, but which cannot be shown in Fig. 524 by any other means than a dotted line, and which, in consequence, does not appear. Now, the chickens could find their way, or, rather, make their way, in and out easily enough through spaces, or openings, 1½ inches wide, but the hen could not; so I was obliged to make other provision for the ingress and egress of the hen, and keeping her under confinement as long as it was necessary to do so. I did this by cutting a sliding piece out of a bit of batten, and notching it at each end to work up and down on the battens L and M. It was cut out of stuff 2 inches wide and 1 inch thick, and to the length of 7 inches. The ends

were cut to the depth of 1 inch and made to work easily up and down L and M. Its shape is shown in plan at *b* in Fig. 526. A slot was then cut in the centre 2 inches long, and wide enough to allow the central batten O to fit tightly into it, as shown in elevation at *a* in the same diagram. This batten, which was some inches larger than the others, passed upwards and outwards through a hole, cut for it in the edge of the top board of the roof, and its upper end was cut into shape of a tapering handle, so as to admit of the batten being grasped more firmly and worked up and down with the slide that was attached to its lower end. This, I should say, was attached to the batten by a couple of thin screws 1½ inches long. The front was finished by nailing the board, that is shown at P, and which was 4 inches in width, right across from side to side on the outer front of the battens, that at O being excepted, as a matter of course. Holes were bored in this batten with a centre bit, as shown, so that it might be raised either slightly for the chickens to get in and out when, or if, they could not pass through the openings between the battens, and as high as it was possible to get it, when the hen could be set at liberty to ramble about with her chickens during the day. It was kept in place by putting a wooden peg, or a large nail, into the hole that came above the front edge of the roof when the slide was raised. All appliances of this kind should receive three good coats of paint when made, and a single coat every year, or have a good dressing of Stockholm tar once a year when it has fulfilled its yearly purpose for hatching purposes, and is ready to be put into store.

Wired panels for runs to coops.

894. I must now pass on to coops with runs to them for hen and chickens. These were chiefly built up with panels, if I may call them so, made of framing covered with wired netting. Let us suppose that we are making a panel 4 feet long and 2 feet wide, and that we are making it of the stuff I have always found so useful for things of this sort, namely, battens 2 inches wide and 1 inch thick. Our first care must be to cut two pieces 4 feet full in length, and three pieces 2 feet full in length, the third piece being required as a tranverse stretcher in the middle of the panel. These pieces are cut at the ends, and the longer pieces notched in the centre so as to admit of all of them being halved together, the sides and end rails being joined thus at the corners, and the central rail notched in by halving at its proper place. Now take the netting, and, having secured parallelism and proper position by nailing slips across them as stretchers, fasten it to the sides by staples of small size, such as are used by bellhangers for keeping the wires of bells against a wall. Let the wire and staples be fixed on to the sides of the side rails that

are not notched. When this is done, force the three transverse rails into place, which will have the effect of tightening and stretching the wire. Then screw these rails firmly to the sides, and fasten down the wire to the rails at each end of the panel, and to the central rail as well. The panel is now complete. The mode of going to work will be understood without the aid of a diagram; but those who wish for one will find a panel of the dimensions given figured in connection with the coop built up of such panels as these, which I will describe presently.

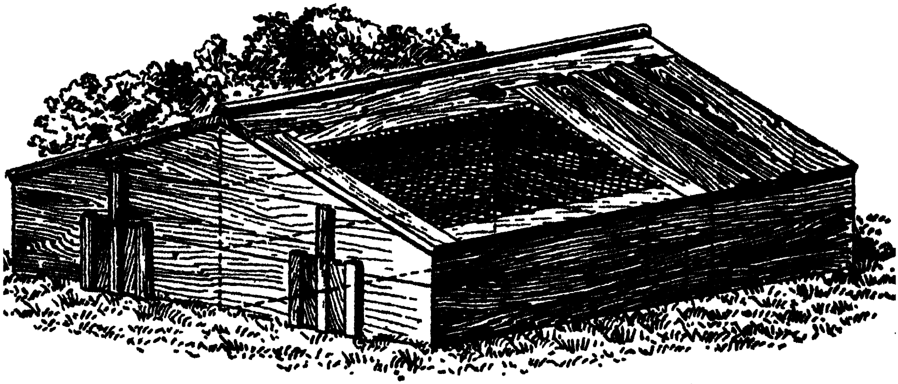


FIG. 527 Double Coop and Runs for Hens and Young Chickens

Double coop with run for hen and young chickens.

Construction and dimensions.

895. Following the natural course of requirements for poultry in the farmstead, from the hatching box upwards, the next thing to be touched on, as I have already said, will be coops for poultry and young chickens, *with* runs, as those without runs have been dealt with in preceding sections. In Fig. 527 the home carpenter will have before him a form of double coop for hens and young chickens, which I have found to be very useful and serviceable. The diagram is in isometrical perspective, and may be taken as being drawn, as indeed it is, on a scale of ½ inch to 1 foot. It is 4 feet 6 inches square, and divided by a central partition into two coops, each 4 feet 6 inches by 2 feet 3 inches. This, it must be borne in mind, is outside measurement. Thus, the compartments in the rear, which are covered in, are 18 inches in length, and 2 feet 3 inches in width, and those in front are 3 feet long. The whole structure is formed of boards 1 inch in thickness, and the sides are nailed to the ends. It may be strengthened by pieces of quartering, 2 inches square, cut in the form of arris rails and fastened by nails or screws, but preferably the latter, into the corners of the structure. The height of the ends in the

centre, from the ground to the ridge-piece, is exactly 2 feet and 11 inches at the extremities; but the home carpenter can increase this to 12 inches if he wishes to do so. The central division, corresponding to, and parallel to, the ends, is also made of 1-inch stuff, and is put in so that the outer face is 18 inches from the outer face of the end that is covered in, and it forms a resting place for the side of the lid. The wire lid, with which the run is covered in, rests on a slip nailed to the division between the open run and the part that is covered in, on the right-hand side, looking at the diagram, and on the edge of the end on the left-hand side. The lids to the covered parts are 2 feet 3 inches long, and 18 inches wide, and the cover to the run itself is 3 feet long and 2 feet 3 inches wide. The frame is made of 2-inch battens, halved together at the corners, and the wire netting that is used is 2 feet in width, with a mesh of 1 inch. The cover to the run is put together in the manner already recommended for making all kinds of wire panelling—that is to say, the wire is first attached by staples to the longer pieces that form the top and bottom of the frame, and the sides are then pressed in.

Central division.

896. The central division between the two coops may be slipped in between ledges nailed on to the ends to receive them, in both the outer and the inner divisions. The home carpenter must be careful to carry this up to the ridge-piece, or at all events within ½ inch of it, and no space must be left between the boards of which it is formed, for the two mother hens will fight, beak and claws, if any opportunity be given them of doing so, and damage will accrue to both the combatants.

Ridge-pieces.

897. The ridge-piece, as a matter of course, was 4 feet 6 inches in length, and may be made in either of the two ways shown in Fig. 528. It is chiefly required as a means whereby the lids of the four compartments into which the whole structure is divided, may be hung and kept in place by hinges. The way in which the lids are made has been fully described, and the joints of the boards of which the lids of the covered compartments are composed, are covered with slips 2 inches wide and ⅜ inch thick. Were it not desirable, and even necessary, that the two lids on each side should work independently of each other, it would be well to nail a slip of this kind to one or the other of them, it does not matter which, having half its width on the lid to which it is fixed, and half overlapping the adjacent lid; but this is prevented, as I have pointed

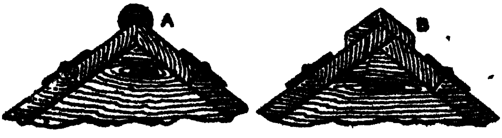


FIG. 528. Ridge-Piece to Double Coop and Run.

out, by the necessity of having the two lids that are placed side by side to act independently one of the other. The two modes of putting the ridge-piece together are shown at A and B. In A, which is the preferable mode, the upper edges of the two boards are bevelled so as to meet together in a vertical plane, and the joint is then covered in by a capping running the entire length, and grooved to fit closely over each; and in B the upper edge of each board is slightly bevelled, as shown, and the joint secured by nailing two slips over each, as shown, namely, slips ½ inch thick and of the requisite width. The larger slips are 5 inches in width, before being bevelled, and 1 inch thick. The diagram is drawn on a scale of 1 inch to a foot.

898. It is scarcely needful to remark that both food and water can be supplied to the inmates of the coops and runs through, or by lifting, the wired lid of the front compartment, and the interior of the compartment to the rear can be inspected at pleasure. The entrances to the inner compartments are 8 inches in height and 6 inches in width, but the home carpenter may make them an inch or two larger than this if he prefers to do so. The dimensions given are, however, large enough. I do not remember to have given a detailed description of shutters to coops and runs elsewhere, so I will do so now, merely saying, by way of giving a general idea of dimensions, that the openings to the runs, through which hen and chickens may be let out into the open ground around the run, are 8 inches wide and 9 inches high. When I made double coops and runs of this kind, shown in Fig. 527, first of all I fitted them with slips put on inside, and closed the openings with movable, or I may say removable, pieces of wood that butted against these slips and were fastened down on the outside with battens. Finding that shutters of this kind often got thrown on one side, and could not always be found when wanted, I next tried hinges and a single button, but I finally fixed on shutters of the kind shown in Fig. 529, which were more secure, because they could be drawn up to their full height without withdrawing them from the grooves, and held in position by a nail, or, better

Entrances and shutters to coops and runs.

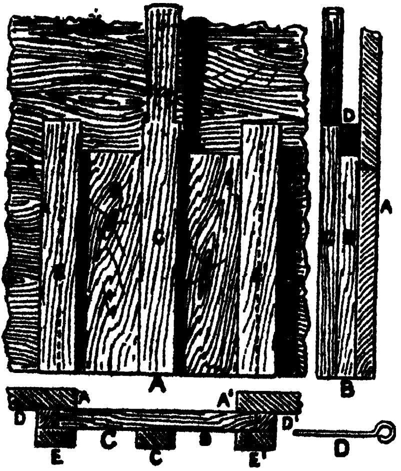


FIG. 529. Details of Construction of Shutters to Runs.

still, by a piece of wire with a turned top, as shown at D. This wire passed through a hole shown in the handle, by which the shutter was drawn up and down, and entered another hole in the end of the run. The front elevation of shutter, grooves, and handle, is shown at A. If preferred, the handle may be dispensed with, and a slip screwed on transversely to the exterior of the shutter by which it may be raised with ease, the hole for its suspension being made immediately below the slip thus attached and the wire shown at D, thrust in the same way through this and into a hole in the end of the run. A side view of the shutter, partly in elevation and partly in section, is shown at B, and a plan is given at C, showing exactly how the shutter is made and fitted with the handle, and how the grooves are made in which the shutter slides up and down. In the several and separate parts of Fig. 529, A and A′ show the boarded end of the run, B the shutter, C the handle, D D′ slips 1 inch square screwed on to the end of the run and fitting loosely against the shutter, and E E′ pieces of batten screwed to the exterior of the slips D and D′ to form the grooves.

899. We will now pass on to the construction of another kind of coop with run, which is shown in side elevation in Fig 530. This is a single coop with a run attached to it, easily removable at pleasure. It will be found by all poultry-keepers to be safe, serviceable, and useful, and transferable, without occupying much space, from place to place, in case of removal from one house to another. The diagrams showing the construction of both coop and run are drawn on a scale of ¾ inch to 1 foot, and this scale covers all illustrations from Fig. 530 to Fig. 534 inclusive. The coop itself, which is to the rear of the run, is simple enough in construction, except in front, as will be shown and explained presently. Otherwise it is a box-like

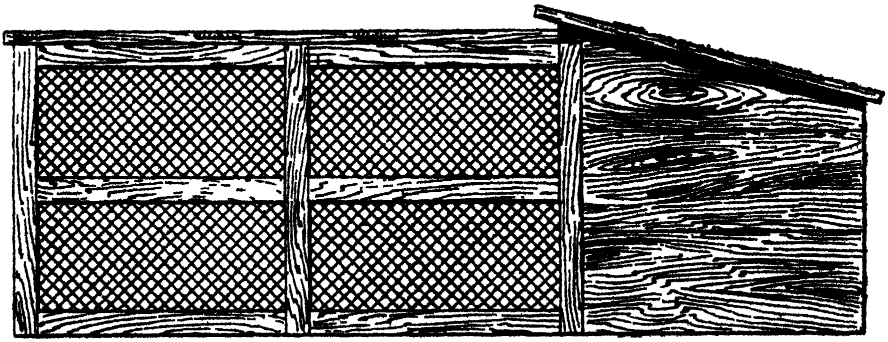


FIG. 530. Side Elevation of Single Coop, with Wire Run attached.

Single coop, with wire run attached.

structure, with a sloping top that can be raised at pleasure. In length from side to side, sides included, it is 2 feet 6 inches, and it is, of course, the same at the back. The sides themselves are 2 feet in width, 2 feet 1 inch in height in the front where run and coop meet, and 1 foot 7 inches behind. The sides are nailed to front and back. The cover projects beyond the front, sides, and back of the coop at top, bottom, and ends, and is, when taken altogether, 2 feet 6 inches from top to bottom, and 2 feet 8 inches from side to side, thus giving a projection of 1 inch clear over each side and at the bottom, and 5 inches at the top. The reason for this will be apparent presently. The upper piece at the top to which the lower piece is hinged, is 8 inches in width, and this piece is securely nailed or screwed to front and sides, preferably screwed. The boards used throughout are an inch in thickness, and the boards of the lid are disposed lengthwise, the joints being covered by slips 2 inches wide and ⅜ inch thick.

Construction and dimension of side panels.

900. We will now leave the closed coop for a while and proceed to a description of the run, which is made of wire panels, framing of the panels being made throughout of battens, 2 inches wide and 1 inch thick, halved at the points of junction, and securely screwed together. Having thus intimated the principle of construction generally, let us take the side panels of the run, as shown in Fig. 530, first of all. These are exactly 4 feet in length and 2 feet in width, and are made in the manner already described in a preceding section, by first of all securing the wire netting, which is 2 feet wide, to the rails at top and bottom with small staples. These rails have been notched to half their depth, namely, by ½ inch at each end, and a notch has been cut in the centre, 2 inches square and ½ inch deep. The centre rail has been notched in the same manner, but no attempt must be made to fasten the wire down to it until it is duly placed in position and the standards, or vertical pieces, are also in position. These are prepared in precisely the same way as the rails, being notched at the ends and centre in the same manner. Now lay the centre rail in the notches made for its reception in the vertical pieces, and screw firmly together, using two screws 1 inch long, and Nettlefold's No. 10, or any number from 7 to 10, for the purpose, remembering that all screws proceed in thickness, or diameter of the blank screw, before the screw thread is cut, from the lower to the higher numbers. In screwing up countersink the wood slightly with a rose bit, so as to bury the head of the screw in the wood, and bring both to the same level. If the screw points project slightly on the other side, remove the points with a file. You have now the top and bottom rails loosely connected by the wire

netting between them and the rigid standards and rail, formed by screwing these parts together. In doing this, test them with the square in every part, so that none of them may be out of place. Now lay out the top and bottom rails on the bench and force the rigid portion of the panel into place. This will bring the wire netting all taut, as Jack says. Lastly, screw the ends of the standards into place, using, as before, two screws to each joint, and attach the netting to the centre rail and standards with staples. The panel is now complete. Make the panel for the other side of the run of exactly the same size, and in precisely the same manner, and then lay them aside until the other parts of the run are completed.

901. Let us now see how best to make the end of the run, which may be done in two different ways, as shown in Figs. 531 and 532. These are 2 feet 6 inches in width, and 2 feet in height, and are different only in a point of detail, so that it is open to the home carpenter to adopt whichever he may prefer. This point of detail lies in the provision that is made for the fitting-in of the door, by which egress and ingress is obtained from and into the run itself, when the hen and chickens are allowed to make their way into the open ground around them. Let us first take Fig. 531, in which the entrance door is placed between transverse rails—one in the centre and the other in the bottom. Now, commence the work in precisely the same way as that which was adopted for the side panels—a strange manner of going to work, the home carpenter will say; but, nevertheless, the best and safest, as will appear presently. First, take the top and bottom rails. Having cut notches of the requisite size and in the necessary positions in the top and bottom rails, firstly at the ends of each rail, and then

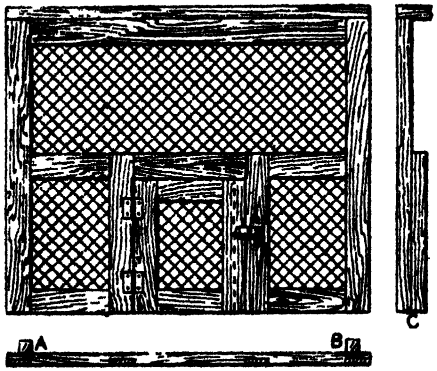


FIG. 531. Construction of End of Run, with Entrance between Transverse Rails.

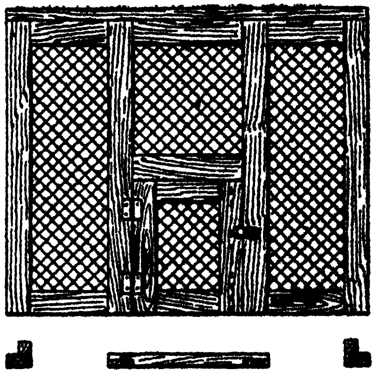


FIG. 532. Construction of End of Run, with Entrance between Vertical Rails.

Lower end of wire run, with transverse bars.

two notches 4 inches long in the bottom rail, commencing at a distance of 8½ inches from the extreme ends of the rail, attach the wire loosely as before. Then take the central rail and side standards and notch them together, and also notch into the central rail the short hanging style and falling style which form the framing of the door. Now, put together the three pieces which form the upper part and sides of the frame of the door itself, and attach this to the hanging style of the door with hinges, as shown in the illustration. Screw the various parts firmly together, and then laying the top and bottom rails with the wire between them on the bench, force into place as before, screw the ends of the vertical rails into the notches prepared for them at the ends of the top and bottom transverse rails. Turn the whole panel upside down, and fasten down the wire netting to the side rails, the transverse rails of the centre, the framing in which the door is hung, and the door frame itself, and prepare a slip ½ inch thick, 2 inches wide, and 2 feet 2 inches long, to be screwed along the lowest transverse bar between the slips A and B, in the section along the central transverse rail, shown at the foot of Fig. 531, when the wire which covers the door has been released by severing the meshes with the nippers with which the home carpenter is provided for this purpose. The slips A and B are 1 inch square, and are provided for the attachment of side panels to the ends. The part representing the end elevation of Fig. 531, shown to the right of the illustration, is merely given to show the attachment of the slip C as a stop to the door attached to the inner edge of the falling style and slightly overlapping the edge of the door, and how the panel is fitted to the side panels, which will be described presently, when all the parts are ready. All that has to be done now is to release the door by passing a tenon saw through the bottom rail between the door and the frame, and to screw the slips already mentioned to the inner side of the frame in the positions shown and described.

902. We will now briefly consider the construction of the door end of the run, made with vertical bars, which, to my mind, looks better than that with transverse bars. The construction and mode of procedure are similar in every respect to that adopted for the other. The wire netting is fixed to the top and bottom rails as before, and then the upright pieces on each side are forced into place, and secured with screws. Next, the central vertical bars with the transverse short rail that connects them with the top and sides of the door, screwed together and attached to the hanging style by hinges, are forced into place and securely screwed down. The wire is then fastened to all the vertical parts and the central transverse rail with staples, and the wire is cut through with the nippers. Lastly, the door is released by

Lower end of wire run, with vertical bars.

means of a tenon saw; the slips, as shown in section in the transverse section of the centre of the panel, along the central transverse rail, are screwed on, and a slip between these is screwed to the inside of the bottom rail. In both cases it must be seen that the door works easily, and can be secured against the stops within, by means of the button shown in each illustration. Made in which way you will, the end of the run is now complete, and may be put aside with the two sides already made, until the top is prepared and ready for use.

903. The top or lid of the wire run is shown in Fig. 533. It is 4 feet long, and 2 feet 6 inches wide, but for the sake of firm attachment to the top rail of the end, it is extended 1 inch in length by nailing or screwing a slip 1 inch square to the end furthest removed from the closed compartment. It is made, not in three separate panels, as the home carpenter might be disposed to think, but in a single piece, in the same way as that which was followed in making the sides or ends. Again the wire netting is fastened to the side rails after they have been duly and properly notched, and the four transverse rails, and then forced into their places. When this has been done, screw the parts firmly together at the different joints, and pass a tenon saw through the wood so as to separate the door from the hanging rail, and from the rail to which the button is fixed. If the part of the panel which is intended to be opened and closed had not been already connected by hinges with the portion to the right, there would, in point of fact, be three distinct panels. As it is, the two panels to the rear are disconnected from the part in front, and they should be marked to ensure that they are always placed in the same relative position. The object of the central door is to put in food and water when necessary. Of course, the home carpenter has understood that it is necessary to nip the meshes of the wire to release the door, and before doing this to have fastened down the netting with small staples. The three parts of the entire panel should be equal in

Top or lid of wire run

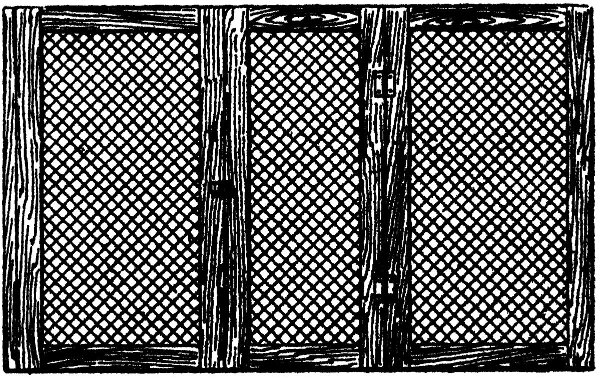


FIG. 533 Top or Lid of Wire Run for Single Coop.

size, that is to say, each of them should be 16 inches in width, not including the slip 1 inch square that is nailed to the outer edge of the top. The slip is shown at the top of the end given in Fig. 531.

Front of closed coop.

904. We have now only two things left to deal with as regards the single coop and run, and these are the front of the close compartment and the method that must be followed in putting the parts of the run together, and then fitting coop and run together. The front is shown in Fig. 534. It is in appearance 2 feet 2 inches high, although in the side elevation its absolute height at its junction with the run has been shown to be 2 feet 1 inch, but this is caused by the extension of the roof in the piece to which the movable part of the lid of the compartment is hung or hinged. The dotted line at the top shows the extent to which the top of the wire run extends, and the dark space above indicates the shadow which is necessarily caused by the upward extension of the roof of the compartment. The edges of the sides, shown in sectional form, are nailed to the edges of the front, which is provided with an entrance in its centre, arched at the top, and 12 inches in height and 7 inches wide. This height is reduced to 10 inches, if, as I have shown, slips 1 inch square are first nailed round the extreme edge of the coop within, and the floor on which the hen and chickens rest be placed on this. There is no absolute necessity for any floor, but it is desirable to have a slip across the opening in the position shown in order to keep the opposite sides of the entrance firmly fixed in the same plane. The front of the coop, as well as the coop itself, is finished by nailing these slips around it in the position shown, not less than 1 inch square, but preferably 1½ inches.

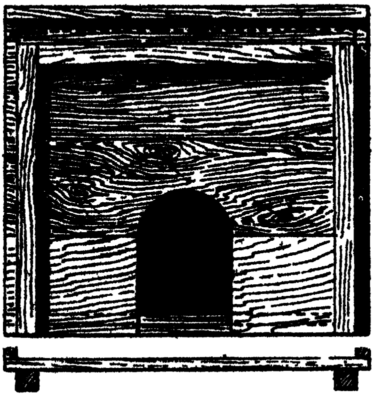


Fig 534. Front of Closed Coop.

Fitting run together and its junction with coop.

905. The parts of the wire run being all in readiness must next be fitted together, so we first take the sides and screw the outer ends firmly to the slips that have been attached to the inner part of the ends, as shown in section in Figs. 531 and 532. This done, the top is taken and placed on end and sides, and screwed down to them hard and fast. The wire run is now put together, and the enclosed end is then passed over the slips, shown in Fig. 534, and screwed to them, these slips fitting into the end

in much the same way as one part of a telescope slides into each other. A solidly connected structure is thus obtained, which will stand a good deal of pulling and knocking about, and removal from place to place; and if the work has been fairly and properly done, the doors both at the end and at the top will be found to be "practicable," as they say on the stage, and everything in connection with both coop and run will be found to be as it should be in every particular. The coops and runs thus made will be found suitable for chickens during the time they are under complete restraint, and will be found to be large enough to serve them as a refuge and place of security by night until such time as they are considered to be fit to mix and mingle with the common herd.

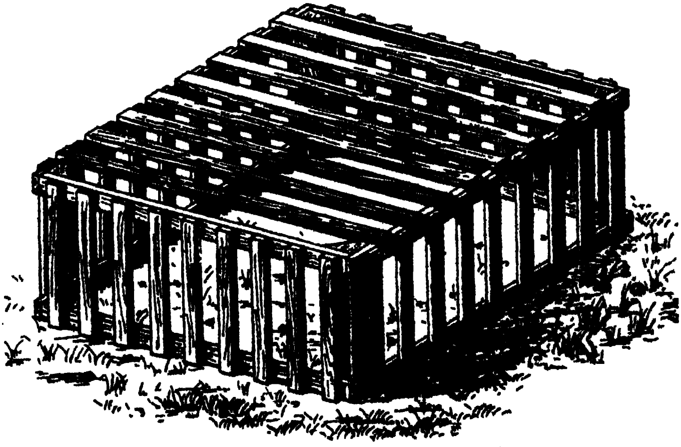


FIG. 535. Feeding Coop for Young Chickens.

906. All who have kept or who are keeping poultry know very well what a jostling and rushing about there is at feeding times on the part of the larger fowls, and how the unfortunate young chickens are the sufferers, and get but next to nothing to eat unless special means are taken for their protection and to enable them to feed in peace. This is best found in a feeding coop, into which chickens can easily make their way, and make a hearty meal at leisure and during pleasure on the grain or meal, or any other kind of food that is thrown into it. A feeding coop of this kind is shown in Fig. 535, which is drawn on a scale of $\frac{3}{8}$ inch to 1 foot, and is $4\frac{1}{2}$ feet square.

Feeding coop for young poultry.

907. The construction of the feeding coop, as may be seen and understood from the illustration, is not one of complex character. It is, in fact, very easily and quickly made. A piece of stuff from 3 to 4 inches square is first cut up diagonally, so as to furnish four pieces of arris rail, each 2 feet long. These are used to form the four corners of the

Construction of feeding coop.

structure, and are connected by rails, from 2½ to 3 inches wide, and 1 inch thick, nailed to the arris rails at top and bottom. Strips of wood, or pieces of battens, 2 inches in width and ¾ inch thick, are then nailed to the rails in a vertical position, as shown, from 3¾ to 3½ inches apart, which is wide enough to admit of the ingress and egress of chickens of some size, and the top is covered in with rails of the same size, nailed at the same distance apart. Taken altogether, it is a rough and ready affair in itself, and somewhat bulky and heavy, but it is in every way well suited to serve the purpose for which it is intended, and costs but little in time, labour, or money to make.

908. This rough and ready mode of manufacture, however, may not suit every home carpenter, and there may be some—not very many perhaps—who may be inclined to make a neater and prettier kind of feeding coop in every way than that which I have just described; so I will show how this may be done, and take advantage of the opportunity to give the home carpenter a short lesson in joinery that may be of use for other things than a feeding coop for chickens and other circumstances, and for this I will refer the reader to Fig. 536, and the various parts that are grouped together to form it. I have myself found it useful for many things, and, without doubt, there are many home carpenters who will also find it of service. As my object now is rather to show *how* this may be done than to apply it particularly to the present case, I have drawn Fig. 536 on a scale of ⅛ inch to 1 inch. It can be used, as I have said, as a neater mode of constructing the feeding coop described above; but for a feeding coop, which should be extremely strong and stoutly built on account of its size, I should use stuff from 3¾ inches to 4½ inches square for posts, and material 3 inches wide and 1½ inches thick for rails. We will, however, content ourselves with material of smaller dimensions for posts and rails, taking the posts at 3 inches square, and battens 2 inches wide, 1 inch thick, and of the necessary length for the rails. Dimensions are of little moment in this.

Useful method of jointing posts and rails

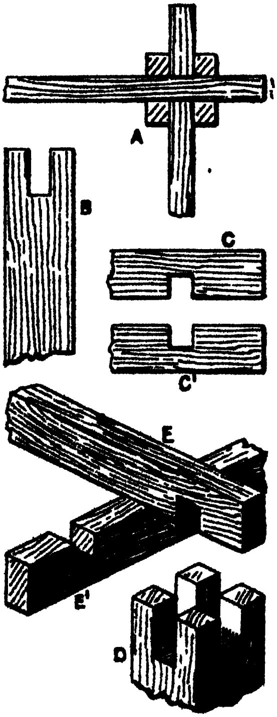


Fig. 536. Useful Method of Framing Posts and Rails together.

909. Taking, then, each post as being 3 inches square, divide the upper part of the post into three equal parts, as shown in the plan of the upper end at A, and in elevation at B—this portion of the diagram serving as the elevation of each side of the post. Having carefully marked out the end and returned the horizontal marking vertically down each side of the post, with the marking gauge set to a distance of 1 inch from the arris, and, further, having marked with pencil and square round each side to the width of the rails, namely, 2 inches, make four saw cuts across the end, two in one direction, and two at right angles to them in the opposite direction, and clear out the material between the four corner pieces that are left even as horns, projecting upwards. Next, take the ends of two of the battens and notch them, as shown at C and C′, so that one will fit over and into each other, as further exhibited at A. Do this at the top and at the bottom of each of the four posts, taking care to make the distance from notch to notch in each rail exactly the same, and you will have a set of posts and rails accurately fitted together and possessed of considerable strength. For the benefit of beginners it has been sought to show the top of the post when cut, and the adjacent ends of two of the battens, in the solid as it were, at D, E and E′. To make everything secure, each of the four horns of the post should be securely screwed to the interposed battens, and a long wire nail, say 3 inches long, may be passed through the notching of the two battens, and as deep as it can go into the post itself, to lend additional strength and security to the joint. The ends of the vertical battens, when nailed to the rails, if taken to be 2 inches in width and 1 inch thick, will be neatly recessed in the space intervening between post and post, with which their outer surfaces will be flush. The top rails may be similarly sunk in notches cut for their reception in opposite battens, but, in this case, it will be better to make the battens 3 inches in width, instead of 2 inches as in the example before us.

Construction of jointing.

910. Instead of using vertical battens, the home carpenter may, if he likes to do so, use iron wires, but if he does, it will be well to use wires $\frac{3}{16}$ inch to $\frac{5}{16}$ inch in diameter, according to the thickness of the batten. If the thicker and more substantial stuff be used, it will be iron rod rather than wire, and to cut it into pieces of the requisite length a hack saw must be used. The best tool wherewith to bore vertical holes in the battens will be a bit in the form of a Norwegian gimlet. Care must be taken to bore the holes in the battens truly vertical. I have not troubled the reader with any reference to the B.W.G., or Birmingham wire gauge, as he will doubtless prefer to have approximate diameter of wire stated in the terms given.

Wire rails.

911. As the primary duty of a pullet when it has arrived at maturity is the laying of eggs, the next thing that I shall take occasion to describe will be a laying box; and as I think that privacy is much desired by all hens and pullets when laying, I have contrived pairs of laying boxes strictly on these lines. Further, it may be said that they meet in every way the chief desideratum of the poultry-keeper, which is security; for if the box is kept locked until the poultry-keeper pays his daily visit to carry off the spoil, I defy any one, however astute and cunning he may be, to enrich himself with eggs at the proprietor's expense. This, I think, will be self-evident from the plan of the laying box shown in Fig. 537, in which A is the common entrance to the two boxes, one on the right hand and the other on the left, and B and C passages through which each bird passes to the chambers D and E where the eggs are deposited. The method of construction is self-evident, and all I need do here is to mention that the plan in Fig. 537, as well as the other illustrations that belong to this subject, are drawn on a scale of ¾ inch to 1 foot, and that the double laying box is 3 feet 9 inches in height and 2 feet 3 inches in width, and that the material used is ¾-inch stuff. The passages, therefore, are 7½ inches wide, and the chambers D and E are 17 inches square. The egg box is supposed to be made of boards nailed together edge to edge; but the home carpenter, if it appears to him that this mode of construction is scarcely strong enough when the size of the box is taken into consideration, can strengthen it by the introduction of quartering cut in the form of arris rails, which will make it strong and stable enough to all intents and purposes.

Laying boxes for fowls.

Plan of laying box

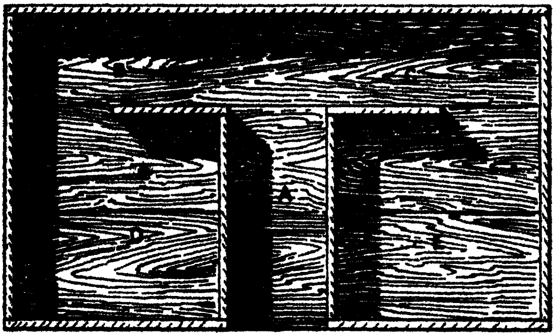


FIG. 537 Plan of Laying Box

912. The construction of the front and side elevation of laying box, as exhibited in Figs. 538 and 539, is also tolerably self-evident, although there are one or two peculiarities of structure which must be noticed presently. Every home carpenter will know how to make the arched entrance to the common passage, and will be fully conscious that Fig.

Front and side elevation of laying box.

539 is intended to serve a double purpose, inasmuch as when the arched entrance to the passages B and C, in Figs. 537, is covered over and supposed to be occupied by a continuance of the boarding, it will represent end elevation, whereas, taking it as it is drawn it gives a view of the partition that separates the laying box from the common passage A, and the arched entrances to the inner passages B and C, as I have just said, that lead to the laying chambers D and E. The holes for ventilation will be fully understood. Now, what I have to point out is this, that Figs. 538 and 539 show the laying box in two ways, first as a structure without legs, and then as a structure with legs; for it may be convenient to some amateurs to make it in one way, and to some to make it in the other way. When made without legs, the bottom should project slightly and be rounded off in the form of a nosing, but when made with legs this nosing should, or rather may, be omitted. The lid should have a nosing whichever way the laying box be made. When constructed with legs, let the boards at each end be disposed vertically, as shown at A in Fig. 539, dowelling them together and marking the joints with these slips. Screw the edges of these hard and fast to pieces of quartering, as shown both in Fig. 539 and in half plan in Fig. 540 at B and C. Notch these at top to receive a piece of batten running along the top in front and behind, to which and the quartering to screw pieces of wood as at D and E,

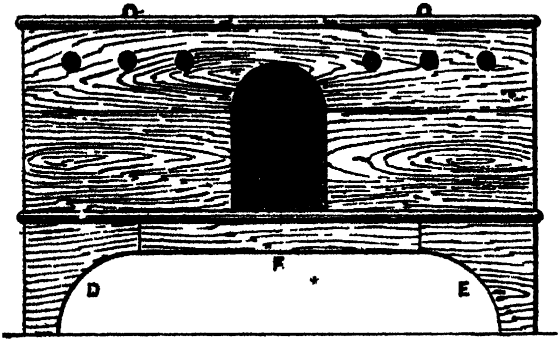


FIG. 538. Front Elevation of Laying Box

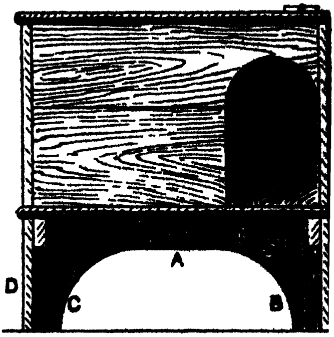


FIG. 539 Side Elevation and Partitio of Interior Chamber from th Common Entrance

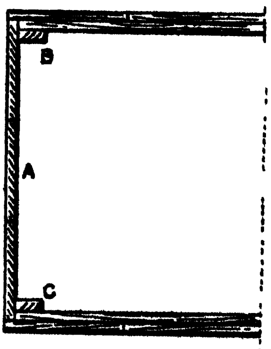


FIG. 540. Half Plan of Arrangement for Legs under Laying Box

filling up the space intervening with a narrower piece of the same thickness, as the bracket-shaped bits. These pieces are shown respectively in each diagram, as far as can be done, at D, E and F. The legs at the side can be made in the same way, and in this case there will be no necessity to place the end boards vertically. The stand, if made independently, may be attached to the laying box by pieces of arris rail, cut from quartering, laid in the angles and screwed firmly to battens and bottom of box.

Top of hatching box.

913. The top alone remains, and this, as seen from above, appears in Fig. 541. In the top there is this peculiarity, that it will either open altogether, as a singlê piece, or partly on each side of the central portion, thus uncovering each laying compartment in turn, or both at once. Its construction is clear enough from the diagram itself, which shows it as being composed of boards jointed togther by dowels, or by grooving and tonguing, as may be preferrod. Each component part is hung to a piece of batten or slip of timber which runs from side to side over the back of box. The lid with the hanging piece should be about 1 inch wider than the entire box itself, that is to say, instead of being 3 feet 9 inches by 2 feet 3 inches it should be, including the hanging piece, at least 1, if not 2 inches larger each way. The peculiarity of its construction is that it is rebated for about 1 inch in width to half its thickness on the under side along the inner edge of each side piece of cover, and the central board between them is rebated to the same extent on both edges at the top, as shown in a larger scale in Fig. 542. The effect of this is, as already pointed out, that although the lid on each side and over each laying chamber can be raised by itself, the top can be lifted as a whole by placing the hand under the edge of the central board. A slot is cut in each side piece in front close to the edge; this passes over a staple, through the

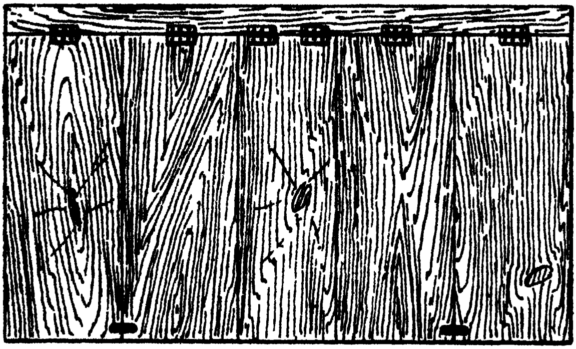


FIG. 541. Top of Box seen from above.

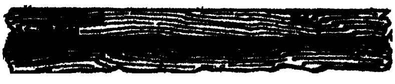


FIG. 542. Front Elevation of Edge of Top in Centre.

bow of which a padlock is passed, which should be kept locked. If made to be placed in the open air the box should be so made that the cover may assume a sloping position; but this needs no description, as every home carpenter by this time will know how to do this without telling.

Construction of stand or carrier for eggs.

914. By natural transition the next step in making appliances for poultry-keeping will be from the box or boxes wherein the eggs are laid to the boxes, cases, stands, or carriers in which eggs are stored from day to day when they have been collected. Construction of the stand or carrier, shown in Fig. 543, is simple enough, and its construction is self-evident. It is drawn on a scale of 1 inch to 1 foot, for clearness' sake, and is, therefore, 30 inches in height and 28½ inches in width. Its depth is 15 inches. These, it must be understood, are outside measurements inclusive of the carcase or case in which the shelves run. The material used is ¾-inch stuff planed up. The case consists merely of two sides and top and bottom, mortised and tenoned together, or nailed top and bottom to sides, and furnished with sliding boards, perforated with holes in which to set the eggs in an upright position. The shelves slide in and out from the front, and are prevented from going in beyond their width by stops at the back of the stand, those on the right and left being nailed to the edge of the sides and the central one notched into the top and bottom. The stops are 2 inches in width and ¾ inch thick. There is a space of 2 inches between the top and the first shelf, and the last shelf and the bottom, and a space of 3½ inches between adjacent shelves. It stands on four feet, 1 inch thick and 2 inches in diameter. The grooves are from ¼ inch to ⅜ inch in depth.

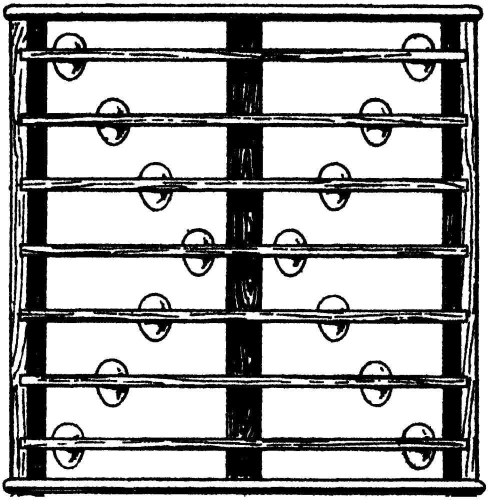


FIG. 543. Egg Stand or Carrier for 252 Eggs.

915. A plan of the sliding shelves is given in Fig. 544, on the same scale as the stand, from which it will appear that they are 27 inches long and 14

The sliding shelves.

Three ply wood.

inches in width. They should not be more than ⅜ inch in thickness. Now, the difficulty in making the shelves is this, namely, that an attempt to make them in ordinary pine or soft wood ⅜ inch thick, with the grain running from side to side, some of the divisions between the holes will be obliging enough to split in the direction of the grain, and so the object of the home carpenter will be frustrated and his labour very likely lost. It will be better, in order to avoid any mischance of this kind, to make the shelves of three-ply wood, as it is called, that is to say, three thicknesses glued together, the grain of the outside pieces running in one direction, and the piece in the middle in the other. With regard to our shelves, the grain of the outside wood should run from end to end, and that of the central piece, which is hidden from view, from side to side. The direction of the grain of the outside pieces is correctly shown in Fig. 544. Wood of this kind is much used in fret-work, and is formed of three thicknesses of veneer. Our shelves must be formed of three thicknesses, each ⅛ inch thick. If the home carpenter cannot get what he wants, he must make the three-ply wood for the shelves himself. It may be done in this way. Cut pieces of ⅛-inch stuff into boards rather larger than the shelf is to be when trimmed up and cut square. Rub this over with good hot glue, and on it place the piece that forms the central part. Rub glue well over this in the same manner, and next place the third thickness. Proceed in the same manner with the wood required to form the remaining shelves, until material for seven is piled up. The first board should have been laid on the bench. Put a board of some thickness over the last layer of the seventh shelf, and on this place the heaviest weights that are available. Let the shelves remain thus for two or three days to enable the glue to dry hard. Cut each shelf to size, and see that it slips readily backwards and forwards along the grooves. If the home carpenter cannot manage the grooving, his better plan will be to graduate the side of the case on the inside, and then form the

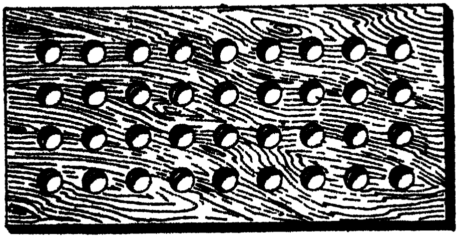


Fig. 544. Plan of Sliding Shelf for Egg Carrier.

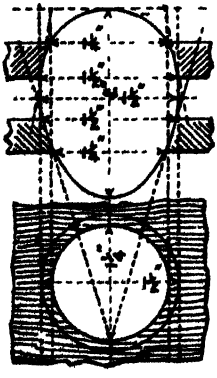


Fig. 545. Diagram showing how the Holes in Shelves should be cut.

grooves by gluing or screwing on pieces of lining, about $\frac{3}{8}$ inch thick, between the parallel lines that mark the run of the *quasi* grooves. Having Fig. 544 before him, and knowing that it is drawn to a scale of 1 inch to 1 foot, the home carpenter will find no difficulty in determining the position of the holes.

916. Now, although an egg is oval in vertical section, it is circular in transverse section, and the holes themselves must be tapering in form, as shown in Fig. 545—larger at top than at bottom. The upper part of this diagram shows the diameter of each tapering hole, above and below. The diagram itself is half size; but the dimensions, namely, diameter of holes at top and bottom, are given. Thus the diameter of hole on the upper side of the shelf is $1\frac{1}{2}$ inches, and at the under side $1\frac{1}{4}$ inches. By turning the page upside down it will be seen that an egg can stand upright in any hole, when put in at the broad end as well as at the narrow end. This is necessary in order to allow the eggs to be turned. The lower part of Fig. 545 is projected from the upper part. Having determined the centre of such holes on the upper surface of the shelf, draw from each centre two concentric holes, as shown, one $1\frac{1}{4}$ inches in diameter, and the other $1\frac{1}{2}$ inches in diameter. Cut out each inner and smaller hole with a centre bit large enough to take out a hole of this diameter, and then work away the slope from the outer circle to the opening in the bottom shelf by means of a sharp shaver, or drawing knife, which the home carpenter can manage to make with the blade of a long and very narrow knife, fixed in two handles of hard wood—one at each end of the blade. A small and very fine wood rasp will also be found useful in bringing the work to a finish, or some rounded pieces of wood, from $\frac{3}{8}$ inch to $\frac{1}{2}$ inch in diameter, with fine sandpaper carefully glued round them.

How to cut holes in shelf.

917. I do not think the home carpenter will require any further directions for completing the egg carrier that I have been attempting to describe. If he shirks the trouble and labour involved in making an egg carrier, or, as is very likely, cannot find time for the work, he can find a way out of the difficulty by making trays, flat or sloping, as shown in Figs. 546, 547. The sevenfold order of division must

Trays in box form as alternatives for egg carriers.

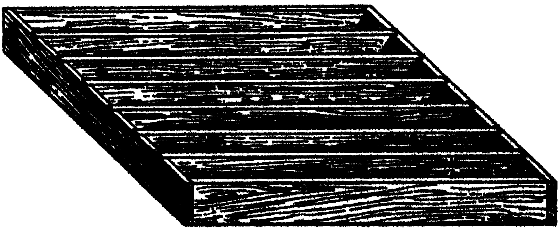


FIG. 546. Tray in form of Flat Box, with Divisions as Alternative for Egg Carrier.

Flat or box-like tray as alternative to carrier.

be maintained, so that there may be one for eggs laid on each day in the week, and the width of each division may be taken at 1⅝ inches, which, I think, will be found large enough for the average size of hens' eggs. No difficulty whatever will present itself in making a tray of this kind; but I may say that it will add to and secure the regularity of the work if the sides of the tray are grooved to receive the ends of the divisions, which are placed lengthways. When the divisions have been dropped into place, they should be bradded in securely from the outside.

Sloping of tray as alternative to carrier.

918. I give another alternative form of tray in Fig. 547. In making this, two sides of the form shown must first be provided, and six vertical grooves made to receive the ends of the divisions at A, B, C, D, E, F. Between these transverse horizontals, grooves should be made to receive the ends of the bottoms of the receptacles in which the eggs for each day of the week are laid; or, if the home carpenter prefer to do so, he may drop them in on ledges attached to the sides for this purpose. A sloping slip should be nailed to the inner part of each side, as shown by G H, to prevent the vertical divisions, which are all of one width, from going beyond a certain depth. The diagram represents an end view of the right-hand end, and may be regarded as being partly the end elevation of the end shown in the diagram, and partly as being sectional. The whole tray must be put together bit by bit. First of all, the back should be nailed to the high ends of the sides, and a stay should be lightly bradded along the front to keep all square. Put in the bottom of the first division, and then slip in the vertical partition at A. Brad this along its length to the edge of the bottom of the first division, and drive brads into this as well from the outside of the back, and from the outside of each side as well, having first indicated by pencil marks the positions into which the brads should be driven. Proceed in this way with each of the other divisions, but note that, as it is not possible to brad in the bottom of any other division from the back, except the first, a ledge should be screwed along the length of the vertical partition at A, on which it may rest, and so on until the box or tray is finished. Then nail on the front, and brad it to the outer edge of the bottom of the last and seventh division.

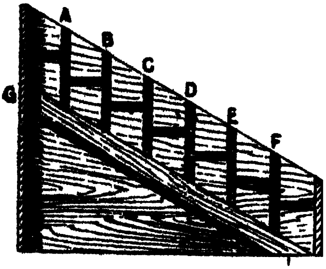


FIG. 547. Tray in form of Sloping Box, with Divisions as Alternative for Egg Carrier.

919. We can now get on another step in making appliances for poultry

Pen for fattening poultry for market.

keeping, and by a natural course of progression we are brought to pens or boxes in which poultry may be fattened for market. This is shown in front elevation in Fig. 548, and in Fig. 549 a view is given, partly sectional and partly elevational, of the inside of the right-hand end of any partition of the pen itself. Both diagrams are drawn to a scale of 1 inch to 1 foot, so that these dimensions in every part are easily determinable. Thus, it appears that the pen is 3 feet 3 inches in length, including sides, 1 foot 10 inches high from the ground level, including top, and 1 foot 5 inches in width, including back and front. The pen throughout is made of material either ¾ inch or 1 inch in thickness, and is therefore a strong and substantial structure in itself. Each box or compartment is just about 12 inches in width, or very nearly so, both ends and partitions being made of 1-inch stuff. The ends of the pen are nailed to the ends of the back, which is made of boards ¾ inch in thickness, this being thick enough, as it is nailed itself from the outside to the ends of the partitions which divide the entire pen into three compartments. It will be noticed that battens, 2 inches in width and 1 inch thick, are notched into the ends A, B, and C, so that their outer surfaces are flush with the edges of the ends. Three stout wire rods, ¼ inch in diameter, are passed through A and into B. This completes the front as far as the batten B, and nothing need be said about the top, except that it projects about 1 inch at front and at the sides, the projecting parts being rounded into a nosing, and that it is divided into three parts, each opening over a compartment and hinged to a

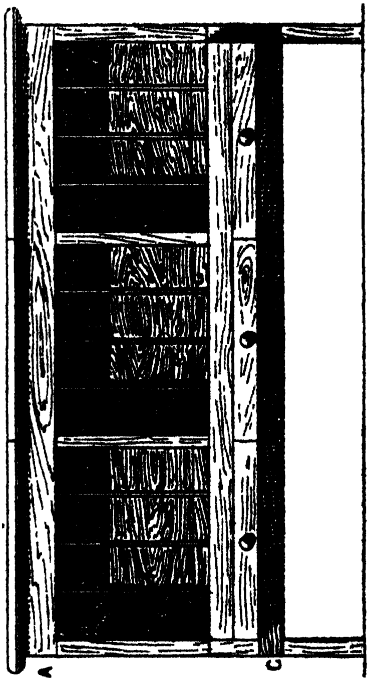


Fig. 548. Front Elevation of Pen for Fattening Poultry.

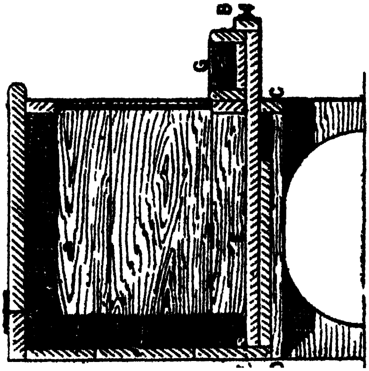


Fig. 549. View of Right-hand End of Pen for Fattening Poultry.

strip at the back, 3 inches in width and 1 inch thick, which runs from end to end, and has its edge at back flush with the back itself. The lids may be fastened down in any way that the home carpenter may prefer.

Construction of bottom of pen.

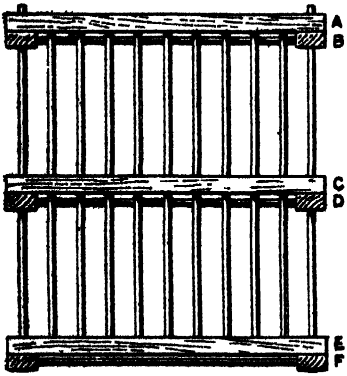
920. There is, however, a peculiarity in the construction of the bottom of the pen, which will not permit of its dismissal in so few words. A ledge, which is clearly shown in Fig. 549, is nailed to the interior of each end, and on these ledges rest the ends of the actual bottom, which are firmly nailed to the ledges, the lowest board of the back being nailed to its rearmost edge. It will be noticed that the permanent bottom of the pen does not extend to and touch the batten C, but that an open space, 3 inches in width, indicated in black in the illustration, intervenes for the whole length of the pen between the foremost edge of the permanent bottom and the batten C. The purpose of this will be fully apparent presently. The partitions between the compartments are carried down to the permanent bottom, and the battens B and C are notched into the top and bottom of each partition, but on the permanent bottom and between the battens B and C, slides a false bottom, shown in section at E, which is held down when pushed home in its place by a ledge, shown in section at F. There is a separate false bottom to each compartment. Now, the home carpenter will naturally ask what is the object of this, and I will tell him. It is desirable that the bottoms of the compartments should be freed from all accumulations, caused by the droppings of the imprisoned fowls, from time to time; and this is easily done, for when the false bottom is withdrawn, the lower edge of the batten B pushes everything that is on the false bottom to the back of it; and this, on the complete withdrawal of the false bottom, falls through the opening between the permanent bottom and the batten C, on to the ground below. And thus the compartments are easily kept clean and quickly cleansed, and when the false bottom is returned to its place, some fresh sand, or fine gravel, can be thrown in from the top, or some cinder ashes, which will help to keep everything tolerably sweet until the next cleansing. As shown in both of the illustrations, a ledge 1½ inches in width is nailed on in front to each false bottom, and these are slightly extended beyond the outermost edge of the false bottom itself, so that no gap is apparent in front of the partitions of the compartments. Further, in each ledge a knob is screwed that the false bottom may be drawn out and returned all the more easily.

The false bottom.

921. The feeding trough yet remains to be described, and this is shown in front elevation in Fig. 548, as far as it is visible along its front, and a sectional view of it with the right-hand end, where it is closed up, is shown at G in Fig.

549. The front and back of the trough, as far as the woodwork is concerned, is nailed to the bottom and each of these parts is nailed to the ends, which are dropped in between them. Partitions are inserted in the trough corresponding in position with the divisions between the compartments, in order to divide the whole trough into three equal parts. Into each of these parts should be dropped a movable trough of zinc, divided by a central partition of the same material into two parts, so that one can be filled with food, and the other with water, or both can be supplied with different kinds of food, as may be necessary. The fowls eat and drink at pleasure, thrusting their heads between the iron bars, and when they have had sufficient, the whole trough, or the zinc troughs only, may be removed as may be considered necessary.

Feeding trough.



G. 550. Poultry Crate—End Elevation.

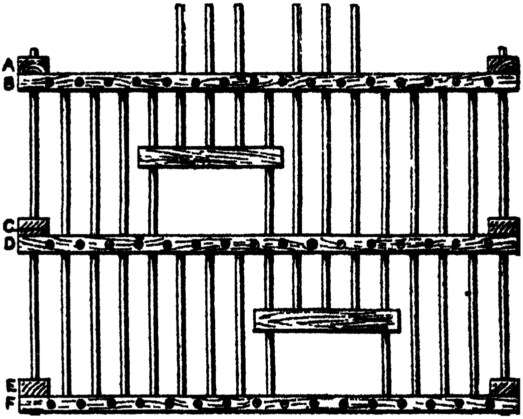


FIG 551 Poultry Crate—Front Elevation.

922. When poultry of any kind is ready for market, it must be sent to the poulterer, otherwise the middleman, for sale; and the next question that arises is—What is the best kind of contrivance for the transmission of poultry from place to place? This will be found, I think, in the poultry crate which I am about to describe, and which is drawn and described in the illustrations given in Figs. 550, 551, 552, and 553. The poultry crate itself is by no means so difficult to make as it may appear at first glance, although it involves considerable care in its making, and means a heavy amount of work for the home carpenter. The drawings are made on a scale of 1 inch to 1 foot, and these are suitable working drawings to scale, which the home carpenter may follow at will. It will be recognised at once that the whole affair consists of rails and bars closely put together, and that the bars through which

the rails are passed are 2 inches in width and 1 inch thick, and that the rails are $\frac{1}{2}$ inch in diameter of the kind used for making plate racks for kitchens. They may be bought in any quantity, of persons who make such goods, and the home carpenter will find it far better to do this than to attempt to make them himself. The bars are best made of some hardwood such as ash, but good pine will answer the purpose. The bars in the ends are superimposed on those of the front and back. In the two illustrations given in Figs. 550 and 551, the corresponding parts are similarly lettered. Thus, the ends of the bars A, C, and E, shown in elevation in Fig. 550, and in end view at A, C, E in Fig. 551. Conversely the bars B, D, and F, shown in elevation in Fig. 551, are shown in end view at B, D, and F in Fig. 550, and so on. The first thing to be done — and this takes some time in doing—is to divide out each bar into equal spacing; and in doing this it will, at first, be useful to know that the crate itself, which is divided into two compartments, one above the other, is in front 2 feet 9 inches long and 1 foot 10 inches high, and that the ends which, as a matter of course, are of the same height, are 1 foot 9 inches long. Exclusive of the end bars, by which the bars that compose the framework are connected, there are fifteen bars in front and back, and nine in each end. Each bar, as I have said, is $\frac{1}{2}$ inch in diameter, and there is a space of $1\frac{1}{2}$ inches between the bars.

Crates for transmission of poultry from place to place.

Dimensions of crate and its parts.

923. This said, it will be no very difficult matter now for the home carpenter to mark out his spaces on every bar, and to determine the centres of the holes that must be bored in them with a $\frac{1}{2}$-inch centre bit. Great care must be taken to bore the holes truly vertical, otherwise the bars will be thrown out of the right direction, and, in all probability, breakage of some of them will be the consequence. It will be noticed that the bars or rails that form the top and bottom of the crate, and the division in the centre, are bored horizontally in the bars of front and back, and between the holes through which the vertical rails are passed. The first thing to be done is to connect the ends of the horizontal bars in front and at the side by vertical rails at the corners, and to see that the proper distance is preserved between them all round, or rather at each corner. Next in order the rails at the back and ends may be put in, and the rails from back to front at the top, bottom, and centre. Those in front must be reserved to the last, as provision must be made for openings which afford entrance into each compartment of the crate above and below. The three bars at each end and the centre bar may be put in, but no more until the free and movable piece in

Construction of crate.

which the lower ends of the two entrances, as shown in elevation at A, and in plan at B, in Fig. 552, have been put in place. These pieces, which slide up and down the fourth and eighth rail, counting from the end rail on the left hand, in Fig. 551, and the eighth and twelfth rail in the upper and lower compartments respectively, have been put in place. These pieces must be notched for this purpose, as shown in B in Fig. 552, and the rails that are attached to them must be fixed tightly in them, though they must move easily in the bars through which they rise when lifted upwards. It is better to make and fit these bars independently of the others, that is to say, to fix the fifth sixth, and seventh rail in the lower compartment, and the twelfth rail, counting always from the left, and then to put in the rails that move up and down in the upper compartment, and this finishes the poultry crate. For the assistance of younger home carpenters who may like to try their hand at making a crate, I have given an enlarged view of the upper right-hand corner of the crate in Fig. 553, showing, perhaps more plainly, its construction, and how the bars are connected and the rails inserted. The diagram itself is not to scale, and must, therefore, be regarded as a sketch view only. The crate, when made, has the appearance of a large cage, and such, after all, it really is, although it is never spoken of as such.

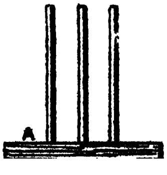


FIG. 552. Bottom of each Entrance

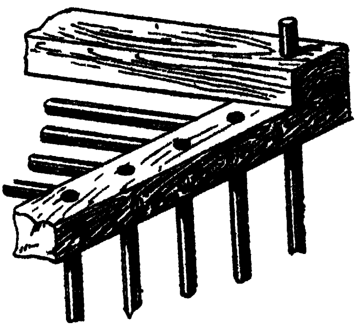


FIG. 553 Enlarged View of Corner of Poultry Crate.

924. The last thing, or, at all events, the last thing but one to be described in this long, but, I trust, not profitless, chapter, is a movable poultry house, which may be transferred from place to place at the pleasure of the owner. It possesses some points of difference from others of its kind, but I venture to think it may be brought into favourable comparison with any of them, as due provision is made for roosting, ventilation, and cleansing, in an easy manner, and for the ready withdrawal of the eggs, which may be laid in its interior by the hens which tenant it, without entering the house itself. How this is done will appear presently. I have thought it better to give a sketch view of the poultry house when complete and ready for use, but its construction in detail will be best learnt from the illustrations to follow. As Fig. 554 is given on a scale of $\frac{3}{16}$ inch to the foot,

Movable poultry house.

it shows that, roughly speaking, the house is 6 feet square, and is 9 feet high in front, exclusive of the wheels, and 7 feet 6 inches high behind. It affords accommodation for about 30 fowls.

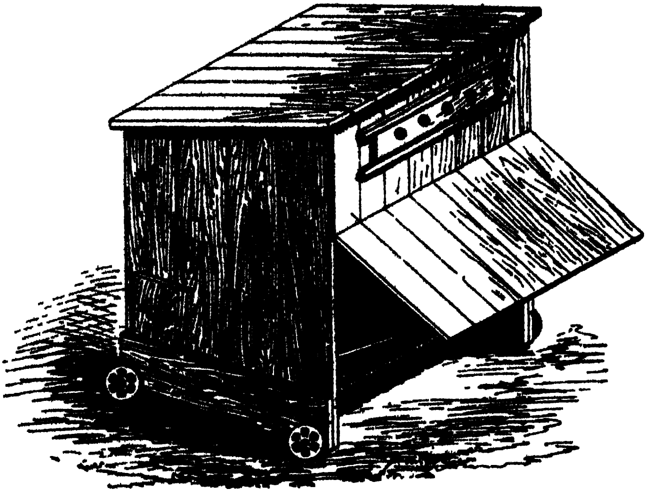


FIG. 554. Sketch View of Movable Poultry House

925. It will be more convenient to commence the construction of the movable poultry house with a plan of the bottom, as viewed within from above. This is shown in Fig. 555, which is drawn on a scale of ¼ inch to the foot. A frame must first be made, consisting of uprights of quartering 2 inches square, or even stouter, connected at intervals of about 15 inches by battens, 2 inches by 1 inch, notched into the quartering, and placed horizontally, or even by quartering of the same size, to which is fixed the vertical boarding of which the poultry house is composed. These battens do not appear in Fig. 555, nor are they shown in the elevation of the interior at the back, as shown in Fig. 556, but they are exhibited clearly enough in Fig. 557, and it must be understood that they are continuous at the back as well. I should say that they are omitted in Figs. 555 and 556, in order to prevent confusion and the obscuration of other parts which it is desirable to show plainly. The parts to which I am alluding are the sides,

Construction of movable poultry house: the framing.

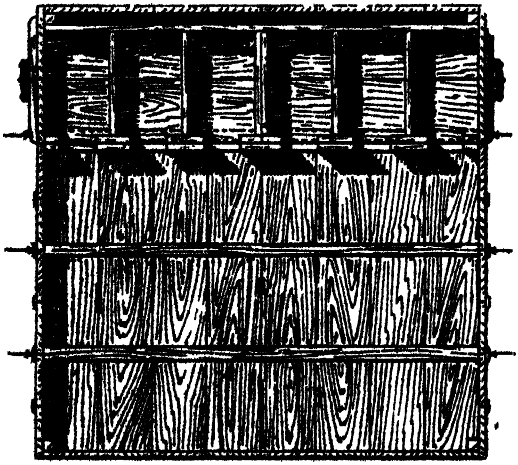


FIG. 555. Plan of Bottom of Movable Poultry House as seen from above.

back and front. It will be readily understood that they must, as a matter of course, be invisible in Fig. 555, as they form in reality joists to which the boarding of the floor is nailed, and, as they are below this, they cannot be seen. Again, they cannot be shown in Fig. 556, because they are hidden by the perches, which are shown, and which cross the structure from side to side. The sides of the framing should be made first of all, and these should then be connected at front and back by the necessary quartering or battens, let in at their proper places. It is better that the connection of all the quartering that is used in the framing should be done by mortise and tenon jointing. If battens are used they can be halved into the framework, being only 1 inch in thickness. This would only reduce the thickness of the quartering at the halved jointing with the batten to 1½ inches, for it is desirable to weaken the uprights no more than by cutting into them to the depth of ½ inch. It will strengthen the framing considerably if three additional uprights of quartering are introduced, namely, intermediately between the corner uprights at the back and sides; and even down the front another may be placed with advantage, as it will in no way interfere with the ingress and egress of the fowls, or the cleansing of the house when requisite.

926. Now, the first thing I want the home carpenter to notice in the plan of the bottom, given in Fig. 555, is that provision is made at the back for two drawers at the back, each containing three compartments, one of which is pulled out on the right-hand side, and the other on the left-hand side. The dimensions, 6 feet square, as the area of the house, apply to the *inside* measurement and not to the measurement externally; and each drawer is, therefore, 3 feet long and 18 inches wide, including the boarding of which it is made. As the boarding is 1 inch in thickness, the interior of each compartment is 16 inches long and 11 inches wide—a space sufficient to allow any single hen to lay in comfort. The compartments are entered by openings cut for them, 9 inches high and 6 inches wide, as shown in Fig. 556, and before each hole, or opening, in the drawer a corresponding opening is cut in the board which runs across the house from side to side and serves to support the outer edge of the sloping roof, with which the drawers are covered in, and receives the droppings of the fowls, and prevents the excreta of those which occupy the uppermost perch from dropping into the drawers and fouling them. The drawers work in and out by the inner side of this board and by the quarterings and battens which form the framing of the back, leaving a clear space of 2 inches between the inner side of the drawers and the external boarding of the house, which is shown by the dark shading by the

The bottom: construction of drawers.

side of the drawing, in Fig. 555. The home carpenter will know by this time how to make a drawer, so any remarks on its construction are unnecessary.

Interior of the house at back.

927. The construction, movement, and housing of the drawers will be apparent to those who may not exactly understand what I have advanced in the preceding section from Fig. 556, in which I have supplied a view in elevation, and a working drawing of the back of the fowl house; and from this more may be gathered of its purpose and general utility, as well as construction. From this it will be seen that the boards of the roof run from front to back, and that the joints are protected by slips ¾ inch in thickness: but the roof may be covered with roofing felt, and tarred, if preferred, or with corrugated iron. In short, all the external boarding of the house is vertical, and the joints of the boards are protected in this manner by slips. The three perches whose position is indicated by arrow points in Fig. 555, are here more clearly perceptible, and that is even more clearly shown in Fig. 557, in which the brackets on which the ends are lodged, are plainly shown. A space of about 21 inches intervenes between the ground level on which the wheels rest, and the under part of the floor of the house, and by this shelter is secured for the fowls in wet weather, when they can find a retreat here without going into the house. The lower part of the poultry house is strengthened both within and without by lining, or pieces of board 1 inch in thickness, placed laterally from end to end. Through holes in these boards, which should be bushed with thick metal tubing, pieces of gas piping of a diameter internally corresponding with the diameter of the axles of the wheels, pass the axles themselves on which the

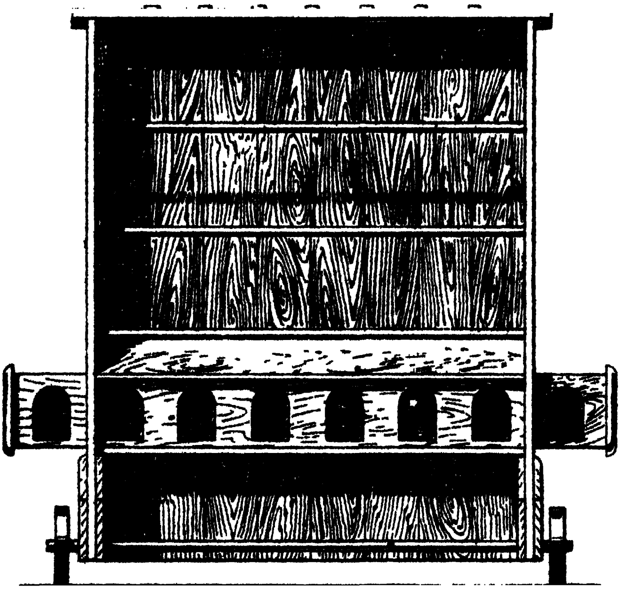


FIG. 556. Elevation of Back of Interior of Movable Poultry House.

wheels are turned. The wheels themselves should be of iron, and at least 2 inches wide in the tyre, so as not to cut too deeply into the ground and retard locomotion. The house will be far too heavy to be moved from place to place by man power, and this must be effected by aid of a pony or strong donkey, harnessed by traces to a whipple-tree, attached to a strong hook inserted for this purpose in the back, and passing through a stout block of wood, or even a stout bar of wood, placed transversely across the back to afford the requisite strength for the maintenance of the hook in its place. The working drawings given in Figs. 555, 556, and 557, are so clear, and show the construction so plainly, as to render any long description in detail needless.

Interior of the house at side.

928. Finally, we come to Fig. 557, in which is shown an elevation of the right-hand side of the interior of the movable poultry house, as seen from within. The horizontal battens across the side, from one corner upright to the other, are plainly shown, and their utility in forming means of attachment for the external boarding will now be easily understood. The brackets, which are notched to carry the ends of the perches, are composed of thick pieces of wood, say 1½ inches in thickness, screwed on to blocks whose surface is flush with that of the lateral battens or quartering, whichever may be used. The position of the drawers, and of the boards by which the drawers are covered and protected, are here shown in section in the same manner as the poles which form the perches. And here, by the way, let me say that all perches, if made of wood by the home carpenter himself, should be rounded, but that rough poles are infinitely preferable. The roundness is absolutely necessary, because it enables the perching bird to get a fair grip.

Front of movable poultry house.

929. Lastly, in connection with the movable poultry house, it is needful that I should add a few remarks about the front. The space underneath the house is always open, but the front of the house may be opened and closed at pleasure, by boarding attached to the upper portion and supported by bars, the lower ends of which are movable only on a bolt which passes through the framing, the upper and free end fitting into the notches of a rack attached to the edges of the movable part of the front, so that it may be placed at various inclinations. Thus this part of the front forms additional cover, under which the fowls may shelter themselves in wet or inclement weather. In Fig. 554 I have shown means of ventilation above the movable part of the front, which may be opened or shut at pleasure by a sliding board pierced with holes, which can be put in such a position that the holes in it coincide with holes in the boards of the upper front, or by the motion of an inch or two

either way can close them. If it be preferred, a window can be placed in the front at top, which should only be allowed to open slightly, and be made to work on swivels, after the manner of a ventilator, or ventilating window in a greenhouse, which is generally actuated by cords fastened at the ends to the window itself, and secured by a cleat. It is desirable that a house of this kind should receive three good coats of paint when finished, or dressed with Stockholm tar, and be painted or tarred once a year. Gas tar should on no account be used. The interior of the house should be lime-washed at frequent intervals, in order to keep it sweet and clean.

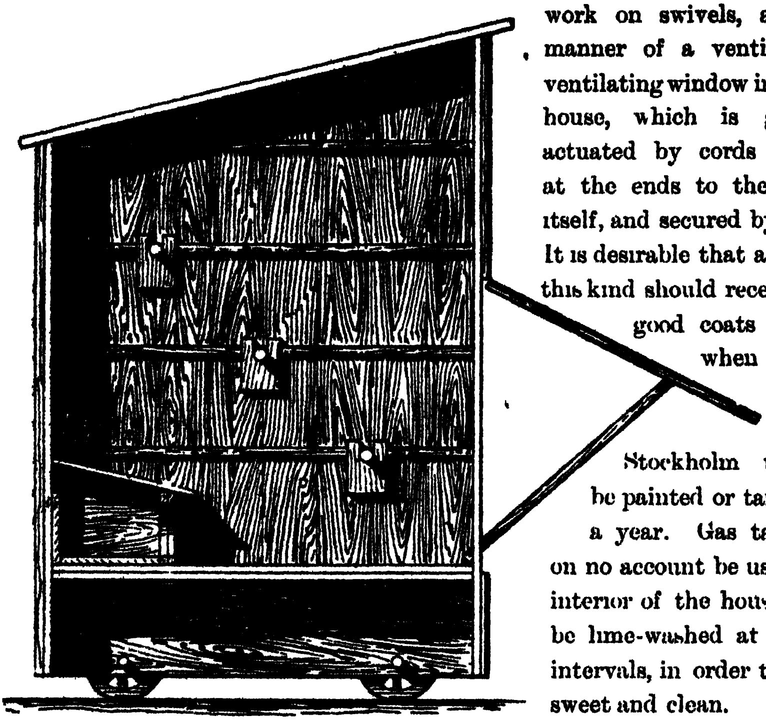


FIG 557. Elevation of Interior of Right-hand Side of Movable Poultry House

Requirements of turkeys.

Turkey or fowl ladder.

930. I have said nothing about turkeys specially, because everything that has been said about fowls is equally applicable to these birds, and what may be done with and for fowls can be done with and for turkeys. In a state of nature these birds roost in trees, and like to perch as high as ever they can. This tendency should be provided for in any shed, huhay, or cowhouse, in which turkeys are kept. The best way of effecting this is by a turkey or fowl ladder, as sketched in Fig. 558. This is very simply made, being composed of nothing more than three long poles, with transverse bars nailed to it at from 2 to 3 feet apart. When used in a shed, the upper ends of the poles may be nailed to the wall-plate of the shed, provided it is in such a position that this can be done. All the transverse poles are nailed to the outside of the vertical poles, as I must call them, with the exception of that at the foot, which is nailed to the inside, so that it may be in a better position to butt against

and be sustained by the pegs driven into the ground at the foot of each of the long slanting poles.

931. I cannot loiter on my way towards the end to say anything at length about the adaptation of cow-sheds or out-buildings for poultry, especially fowls and turkeys. I have myself kept poultry in a long cow-shed and have adapted it for use in this way, and for different kinds of poultry, by separating every stall by wire netting above, and by nailing vertical bars, or boards, to the barred—and very openly barred—partitions below. Access from one division to another was attained by wire doors, whose structure and mode of fastening by wooden hatches has been described elsewhere. The large folding doors, through which the cows passed from the shed to the farm yard and *vice versa*, were left as they were, and I merely closed the openings by pieces of wire netting stretched from side to side and fastened together at the edges with binding wire; and with this I bring the present chapter to a close

Adaptation of cow sheds for fowl-houses.

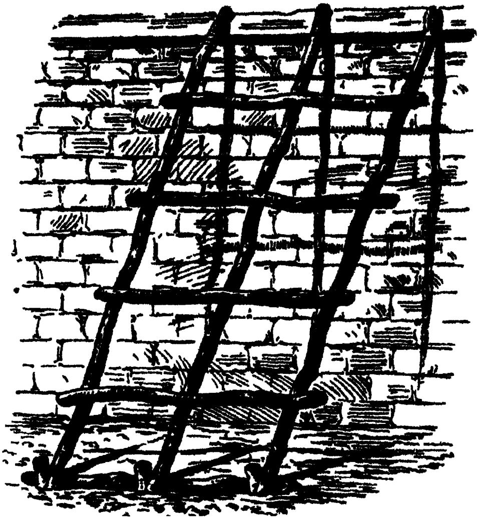


FIG 558 Ladder for Turkeys or Fowls in Shed.

CHAPTER VIII.

CONCERNING DUCKS AND GEESE: THEIR HOUSES, HOVERS, AND SHELTERS.

Form of House Suitable for Ducks—Dimensions of Duck-House—Construction—Circular Pond for Ducks—Construction of Pond Proportions and Dimensions—Rendering Sides and Bottom of Pond Waterproof—Completion of Pond—Entrance for Ducks—Duck Hovels or Hovers Wattled Shed for Geese—Dimensions of Shed—Construction of Side Panel of Shed—Continuation of Construction—Attachment of Panels to Uprights at Corners How to Fix the Roof.

932. About ducks and geese I have not much to say, and what I have to say relates chiefly to the houses, hovers, and shelters that are more or less necessary for their safe keeping.

933. I will deal with ducks and their requirements first of all, and take the geese after. Ducks, if separately lodged—and it is much better to keep them by themselves if possible, and not with the larger and heavier geese, from which, if housed with them, they have to endure much persecution—are very easily provided for. Three or four ducks at the utmost are allotted to a single drake, and each lot should possess its respective pen in which the associated birds may rest and remain in peace and security. It is supposed

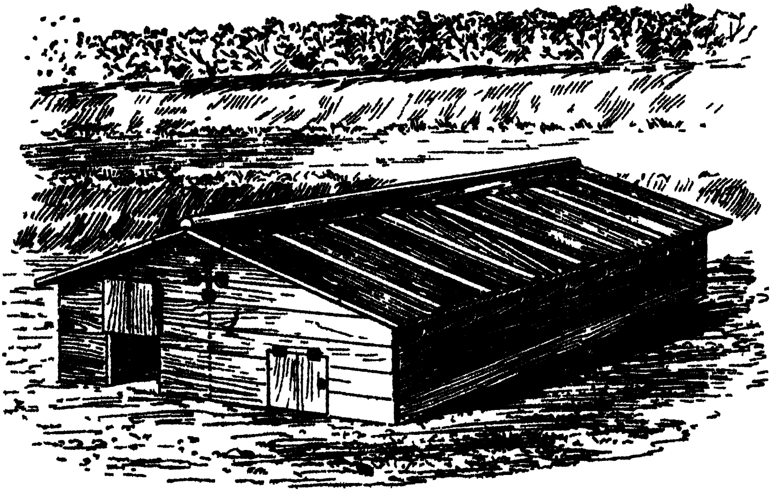


Fig 559. Form of House suitable for Ducks

to stand on grass land, near a pond, which is ever needful for their comfort and well-being; but it may be located anywhere, and in any position or situation convenient for the purpose, and where there is standing room for it; but the chief requirement is that it shall be near the pond. No provision need be made for laying.

Form of house suitable for ducks.

934. The house, as shown in Fig. 559, is supposed to be placed on grass land, as I have said, but it matters little on what it is placed as long as the ducks are warmly lodged and safely housed at night. The house furthermore, as shown in the illustration, is not drawn to scale, but is taken to represent a building 6 feet square, and divided within into four parts, each 3 feet square, affording accommodation for four lots, each consisting of three ducks and a drake. It matters not whether the house be 7 feet, or even 8 feet square, as long as the equilateral form is preserved; but, if made larger, as far as the length of the sides is concerned, it will be desirable to build it higher in due proportion. In the building now under consideration, the height in the centre is supposed to be·3 feet, and the height at the corners 2 feet. If 7 feet in length and breadth, it will be as well to make the height in centre under the roof-ridge 3 feet 6 inches, and the height at the corners 2 feet 4 inches; if 8 feet in length and breadth, then 4 four in height under roof-ridge, and 2 feet 8 inches at the corners. The size must be determinable by the home carpenter himself. Personally, the size with me would depend entirely on its being made for shifting its position, or to remain in permanence. If the former, I should select the smallest size, and make it altogether lighter in construction; if a fixture, I should take the largest size, and make it heavier and stronger in every respect.

Dimensions of duck-house.

935. The house itself is made of timber entirely, covered in by a roofing which opens and which overhangs front, back, and sides, so as to keep off the rain as much as possible from the building, and to carry off the rainfall clear of the walls. The mode of erecting the house has been described so frequently in this work that there is really no occasion to go through it again. It consists of an internal framing, which is hidden from view by the external coating of boards with which it is covered. The front, and sides, and back may be boarded plainly, due regard being had to the exclusion of moisture at the jointing of the boards, or it may be weather boarded, which I should consider to be the better mode of construction. The roof is constructed, as shown, of boards placed vertically, and carefully covered in with slips at the jointing of the boards. Each part of the roof—and there are two parts on each side—moves independently of the other, and is hinged with cross-garnet,

Construction.

or T hinges, to a transverse board which meets the corresponding board on the other side under the roof-ridge, or capping. The covers which form the roof should be well dressed, as, indeed, should be the exterior of the building, with Stockholm tar. If built to be a permanent structure, the outside of the roof might be covered with good roofing felt. The doors open outwards and upwards and are held open, when in that position, by a button at the top. Holes, 2 inches in diameter, are made in the topmost boards just below the overhanging roof, for the sake of ventilation. The partition within from side to side should be carried to the roofing to lend support to it, but that which runs from front to back need not run so high, thus rendering ventilation as full and free as it can be in a house of such construction. The roof should close over staples, and be secured at night with padlocks.

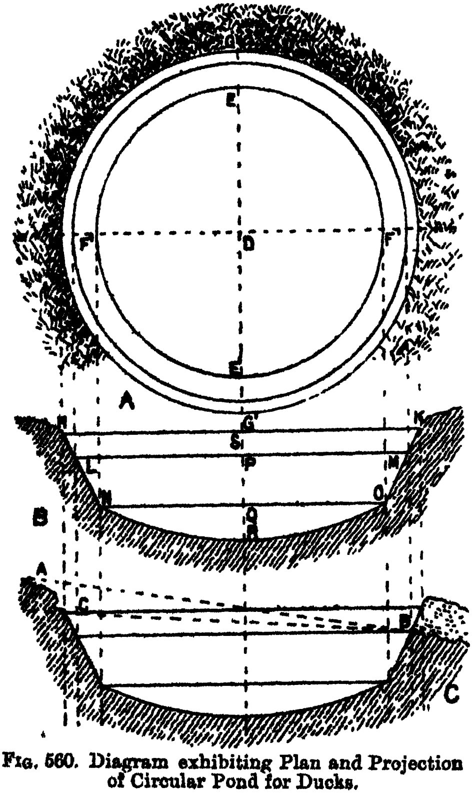


Fig. 560. Diagram exhibiting Plan and Projection of Circular Pond for Ducks.

Circular pond for ducks.

936. So far so good, then, for the house. The pond is the next thing that requires our consideration, and I have shown the plan and projection of a circular pond in Fig. 560, supposing that no pond exists and that it has to be made. The pond shown in our diagram is drawn on a scale of $\frac{1}{8}$ inch to 1 foot, and, therefore, represents one of good size—15 feet, in fact, from edge to edge. Of course as long as the mode of construction is followed, the maker may please himself as to size, but it may be said that no pond should be less than 8 feet across, and this for a limited number of ducks only, say from four to five. A pond 12 feet across represents one of fair average size. But whether large or small, the depth given should be adhered to, or very nearly so, and the pond shown in the diagram has a depth of water of 3 feet in the centre. No pond should be less than 2 feet in depth, at all events.

937. I have chosen the circular form for our pond, because, after all, it is easier made than any other. A pond of irregular form certainly presents the most attractive appearance if it can be suitably planted round and about the sides and backed with trees. This, however, can best be accomplished when the condition of the soil is favourable to the construction of a pond, and nothing in the way of walling round it is required; but I must suppose that the soil is not favourable for pond making, and deal with the subject accordingly. First, with regard to the ground: make choice of as level a piece as can be got, because if it be out of level, as shown at C, in which the ground is considerably on the incline in its original condition, as shown by the dotted line from A to B, but which suffers reduction, as shown by the lower dotted line from C to B, in the course of excavation which brings the lowest point in the ground, namely B, just at the level of the water within. In such a case as this nothing remains but to throw up the earth removed from the pond, and make up the ground to the right hand above B, as shown by the dotted mass, in such a manner and to such an extent that it may become consolidated, and bring the hollowed interior and the margin very much into the form shown above at B. In other respects, the excavations in and at B and C, being identical, the work that is done in each will be the same.

Construction of pond.

938. As level a piece of ground having been selected as can be got, let us proceed to work, and drive in a stout stake at D, which is to be the centre of the pond. In A, D E represents a semi-diameter, or radius of 6 feet, and, therefore, the diameter E E′ is 12 feet, and corresponds with N O in section of pond in B, where the sides of the pond begin to slope upwards and outwards. Again F F′ represents a diameter of 14 feet, which corresponds with L M in B, which indicates the highest level to which the water rises in the pond. Lastly, G G′ is a diameter of 15 feet, which corresponds with H K in B, and shows the utmost limit in the size of the pond, and the line at which any building-up of the sides of the pond will terminate. Now, in forming the pond, the first thing to be done is to trace out a circle, 15 feet in diameter, and this is easily done by means of a line, looped so as to work round the stake that was driven in at D, and an iron spike or rod carrying the line round it at a distance of 7½ feet from D. This done, commence to excavate the pond, and carry the removal of the soil downwards to the depth of 3 feet, namely, from S to Q in B, always taking care to preserve the proper slope, as shown in the diagram. When the depth of 3 feet has been reached, the level N O in B is attained, at which the diameter of the excavation should

Proportions and dimensions.

have decreased to 12 feet. This stage reached, deepen the centre of the pond at N to the extent of 18 inches, rounding at the bottom in the form shown. This completes the excavation.

Rendering sides and bottom of pond waterproof.

939. Now comes the making of the sides of the pond waterproof, so as to retain the water that is conveyed into it and stored in it: and this must depend entirely on the nature of the soil in which the excavation is made. If the soil be light, loose, and friable, the pond at bottom and sides up to the level L M must be lined with concrete. If, on the contrary, the soil that is reached at this depth be a stiff, tenacious clay, or even loam, it may be "puddled," that is to say, worked and kneaded together in such a manner as to render it perfectly stiff and hard when dry, and subsequently to the completion of the process impervious to any water that may be brought into it, and, therefore, capable of resisting and preventing any escape, except by evaporation from the surface. And when the bottom and sides of the pond, up to the level L M, can be treated in this way, the slope above from L to H and M to K can be lined in a similar manner, but care should be taken to insert a means of escape for the water when it reaches the level L M by drain pipes, which will carry off the surplus water sufficiently far from the pond to allow it to dissipate and make its escape slowly into the soil at some little distance from the pond. And this, in point of fact, is all that need be done, under the conditions mentioned, to render the pond complete.

Completion of pond.

940. But supposing that the soil is light and sandy, and it has been found necessary to line the bottom and sides with concrete as high as the level L M, different measures must be taken to complete the walling round of the pond, and complete it up to the level H K. In such a case, recourse may be had to different modes, which may be suggested by local circumstances. If concrete has been used for securing the sides and bottom of the pond against the escape of water, the concrete walling may as well be continued up to the level H K, care being taken to insert overflow pipes to prevent any undue rise in the height of the water. In other cases—loose walling—that is to say, walling of stone, or brick, set in such a manner that each successive course slopes outward and downward at right angles to the sloping surface, may be resorted to for three or four courses, the topmost course of two consisting of the same materials, set in cement, so as to form a hard and solid collar round the pond at the top, and this collar should be carried for some little distance, say 18 inches, from the edge of the pond, to prevent any breaking away when trodden on. The loose coursing piled up above the concrete work will provide sufficiently for the egress of water when

it rises above its prescribed level, as well as for the ingress of water, which may find its way into it by drainage of surface water from the surrounding soil by natural gravitation towards the hollow.

941. In making an artificial pond, with a water surface 12 inches below the level of the land that surrounds it, care must be taken to work the excavation in such a way as to leave a means of easy ingress into and egress from the pond for ducks at any convenient position, as shown in Fig. 561. It need not be of any great width, about 3 feet is sufficient; but it must be borne in mind that, although a duck might make its way over the brink of a pond made in the manner described, it could not make its way out unless easy means of ascent from the water were provided by a gentle slope from the land around to some little distance below the surface of the water. The landing-stage shown in the illustration given in Fig. 561 will, however, provide everything that is necessary in this respect, and on no account must it be forgotten.

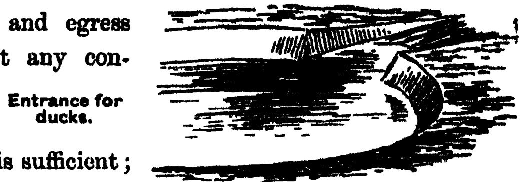

Entrance for ducks.

Fig 561 Mode of Ingress to and Egress from Pond for Ducks.

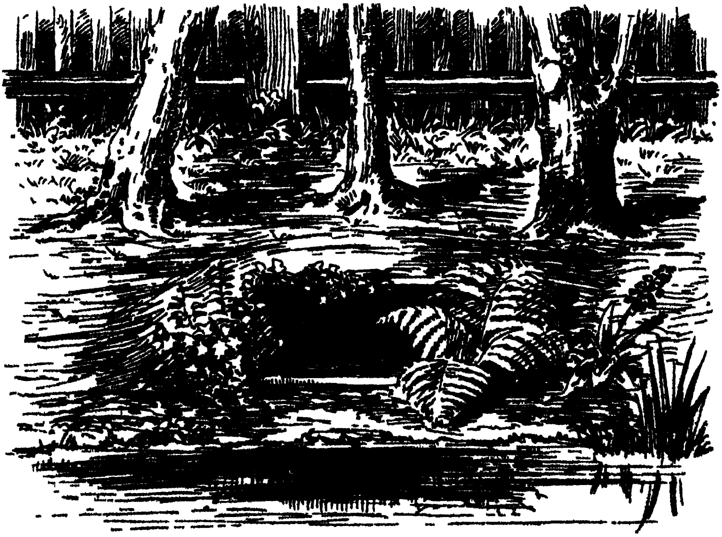


Fig. 562. Duck Hovel or Hover by side of Pond.

942. Adjoining, and forming part of, the farmstead of one of the houses in which I have lived, was a natural pond, encompassed by a high wooden

paling and a belt of land within it, on which grew several trees of the willow kind, and a large oak, and in the banks of this pond I made some artificial hovels, or hovers, for my ducks, in the hope and expectation that they would take to them and lay in them. In this, however, I was disappointed, for the ducks could make their way to the pond from a large shed, or cow linhay, in which they were lodged and locked up at night. Some or other of my readers, however, whose ducks have not access to a shed, wherein to go when they were disposed to lay—and it was there that their eggs were mostly laid—may wish to do the same. I give in Fig. 562 an illustration, coupled with a description of the hovels, or hovers, that I made, which will enable him to follow my example. First of all, I took a strong box—about, as far as I can now remember, from 18 to 21 inches long, from 12 to 15 inches wide, and 9 or 10 inches high, and removed one end of it. It had no cover, and I covered it over with stout cask staves, which I planed on either side so as to bring them to fit closely together. This gave a slightly arched form to the top of the box, and rendered it all the better calculated to resist any pressure that was brought upon it from above. I then excavated a hollow in the side of the pond large enough to take the box, rammed the earth that surrounded it closely to it, and then put a layer of earth and some turf on the cover. This formed a hovel, represented with exactness in Fig. 562.

Duck hovels or hovers.

943. I am now brought to the housing and accommodation of geese, and in connection with these birds I have only to notice and describe a strong wattled shed that is very suitable for this purpose.

944. It is on grass that geese mainly feed, and thus they will thrive and do well on any field or common that can be placed at their service. It is manifest, however, that they should have at their disposal some place of retreat by night; and thus, if no building already exists in which they may be conveniently lodged, a suitable shed for their sheltering may be found in the wattled hut that I am about to describe, and which, being made in parts, may be put up, taken down, removed, and erected anew in any other spot in which the owner of both geese and hut may think proper to place it. The shed itself is illustrated in Fig. 563. It is rough in make and rough in appearance, but serves its purpose admirably in every way. It measures 6 feet in every direction, that is to say, it is composed of panels, back, front, and sides, which are 6 feet square. The panels, four in number, of which the shed is composed, being of this size, it so happens that the shed itself is somewhat larger, as the supports to which the panels are fastened,

Wattled shed for geese.

and of which the panels are altogether independent, have to be taken into account. Thus it happens that the shed itself, taking its dimensions externally, is about 6 feet 4 inches every way, taking the framing of the panels to be 2 inches in thickness, as the supports consist of stakes of quartering 2 inches by $2\frac{1}{4}$ inches, driven into the ground at each corner of the shed, and to which the panelling is fastened. The gable ends at front and back may be made separately and independently of the panels on which they are set, or they may form an integral portion of the panels themselves.

Dimensions of shed.

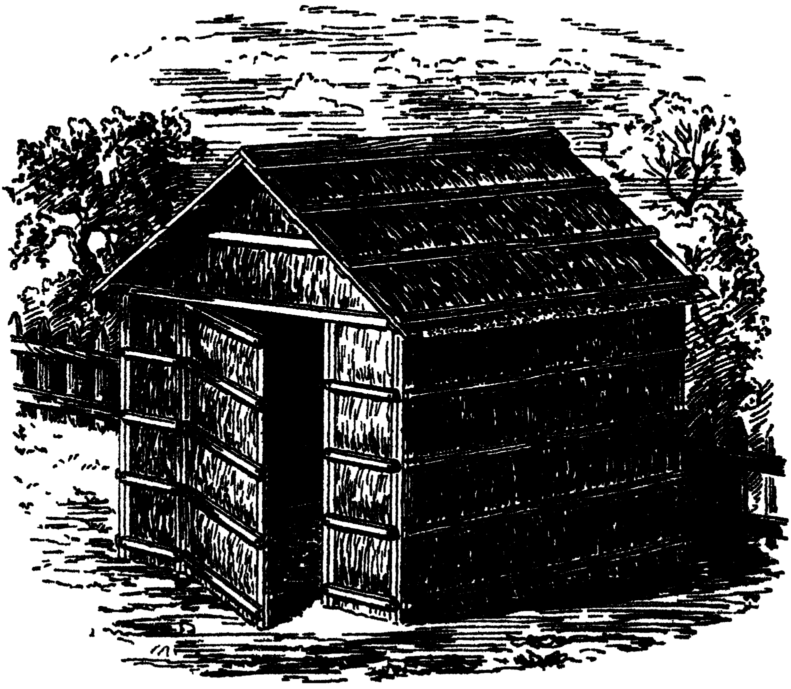


Fig 563 Wattled Shed or Hut for Geese.

I hesitate to say which is the better mode, but I think if I were making such a shed now I should be tempted to include the gables in the panels, making each a part and parcel of the panel to which it forms the top. With regard to the front panel, in which the entrance is placed, a stout piece of quartering is laid from side to side across the interior, to which the panels on each side of the door are placed, are securely screwed, so that although they are apparently separate panels, they, in sober reality, form parts of one and the same panel; and this is the reason why I am disposed to accord my preference to the inclusion of each gable in the panel to which it belongs. Provision for this can easily be made by carrying the standards at the side of the gabled panels a little higher, and halving them into the sloping pieces that form the resting places for the roof, both in front and at the back.

Construction of side panel of shed.

945. But before proceeding any further with the construction of the shed, I had better explain how every panel is made, and go through the process of making in its proper order from beginning to end. This will show how the panels at back and front are to be managed, as well as those at the sides, for, when the home carpenter knows how to make one of them, he has learnt how to make all, and may put what he has learnt into practice as soon as he pleases. With regard to scale, the diagram of side panel, shown in Fig. 564, is drawn on a scale of $\frac{1}{2}$ inch to 1 foot, this size being chosen so that it may clearly appear from the diagram itself how the process of making is managed and carried out. No planing up is necessary: the panels are made all in the rough, and thus the work is quickly done almost as quickly as I can write a description of it in detail. First of all, two pieces of quartering are taken, $2\frac{1}{4}$ inches by 2 inches, which are laid on the ground 6 feet apart, care being taken to preserve parallelism between them by nailing temporary slips to the uppermost side, so as to keep the standards for standards or uprights they are in the panel –from shifting. Then, exactly at top and bottom of these standards, on the side opposite to the temporary slips, the standards having been turned over on the sides to which the slips are nailed, battens, measuring 6 feet in length exactly, and being 2 inches broad by 1 inch thick, or even a little thicker, so we will say $1\frac{1}{4}$ inches thick, in order to make the work as stiff as possible, are to be nailed. Now test with square in order to see that the panel itself is perfectly square, as far as the outward framing is concerned, and this ascertained, measure out the standards between these battens, so as to attach three more battens to them, running in the same direction as those already put on. The battens being 2 inches in width, the standard space between them will be 6 feet or 72 inches – 4 inches = 68 inches. From this a further quantity of 6 inches must be deducted, which leaves 62 inches to be divided into four equal portions. Now, 62 inches divided by four gives $15\frac{1}{2}$ inches, and this is the space on the standard between each adjacent pair of battens. Measure off, therefore, $15\frac{1}{2}$ inches down the standard, beginning at the topmost batten, and nail to the standards another batten corresponding in length, breadth, and thickness, to those already put in place. Measure off $15\frac{1}{2}$ inches more down the standard, and affix the central batten, and then repeat the process for the third inter-

mediate batten. The battens on one side of the standard are now all in place, and the panel as it stands should be fairly stiff and firm. If, however, on testing it, it does not appear to be so, add another standard precisely intermediate to the standards already placed, and nail or screw the transverse battens securely to it. This is the beginning of the construction of the panel.

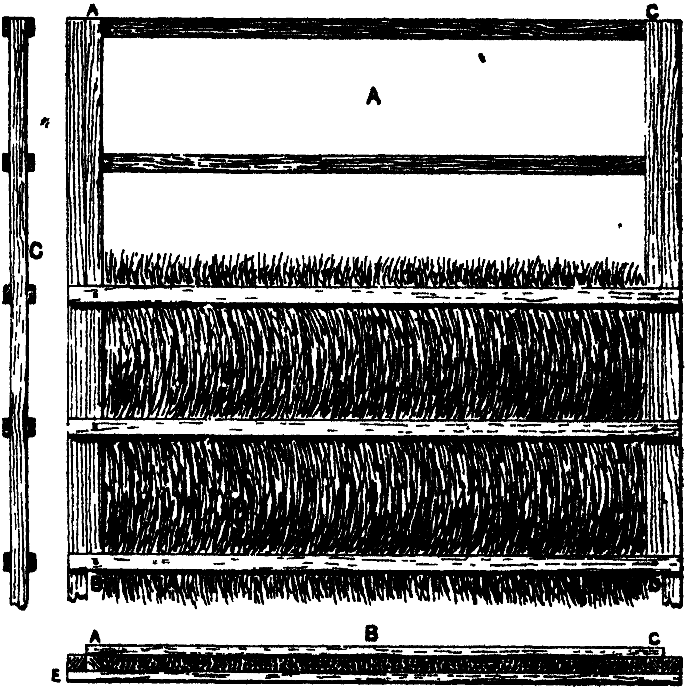


Fig 564 Diagram exhibiting mode of making Side Panel of Wattled Shed.

Continuation of construction.

946. Now turn the panel again and let it lie so that the battens are resting on the ground, forming the back, or interior, of the panel, and proceed to cut five other battens. These, however, must be 6 feet 4 inches in length, instead of 6 feet, and pencil marks should be strongly made round each of the new battens, at a distance of 2 inches from each end, so that they may be accurately placed on and fastened to the upturned faces of the standards. The top of A, in Fig. 564, has been purposely left open and unfilled, so as to show the construction all the more clearly. This may be further seen by looking at end, or section, of panel, given at B, in which A and B respectively show the standards at the ends, and A C the inner batten at top fastened to them. Proceed to lay on this batten the ends of any rough material that may be at hand, twigs, gorse, reeds, or anything of the kind that may be available, packing them as tightly and closely as they will lie together against the batten, and between the standards from end to end of the batten. It is now that the desirability of having stiff standards and stiff

battens will appear; for the material laid on to form the closure of the panel will, in all probability, prove hard and intractable in the handling and difficult to keep in place until the outer battens are secured, as they will be, one by one until the panel is completed. Never mind the ends of the material projecting at the top, for these can be trimmed off level with the battens when the panel is complete. Hold them down by pressure from without and keep them in place until the outer batten is securely fastened down to the two, or three, standards, as the case may be, which have been introduced in the panel's construction. Each end of the outer batten will project 2 inches beyond the standard, as shown at E and F in B. Continue the packing in of rough material as close as can be all down the panel, securing outer batten after outer batten in place until the bottom one is also fastened into place. A rough panel is now made, which is impervious to wet and capable of resisting any weather that may be brought to bear upon and against it. Complete the panel by trimming off the rough material at top to a level with the topmost edges of the battens on opposite sides of the standards, but leave the bottom untrimmed, so that it may touch the ground and prevent the intrusion of anything between the lowermost battens and the ground.

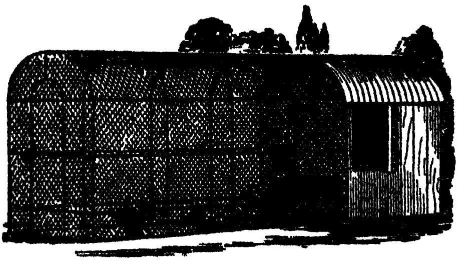
947. In this manner every part of the shed, or shelter, is made, sides, back, front, and roof; but the roof must be made some inches longer than the panels are wide, so as to overhang the shed below it on all sides and in every direction. This, however, the maker of the shed will provide for in the making, so that now it is only the putting of the parts of the shed together that we are concerned. I have said that the panels are to be secured to four uprights that are placed in the ground, one at each corner of the shed. They must be just a little higher than each panel, that they may be so sloped as to afford a bearing for the roof which lies upon them. When they have been placed in position, one of the side panels is placed in position between two of them—any two will do, due regard being had to the frontage of the shed—and the uprights are fairly and firmly butted against the sides of the panel, the projecting battens on each side of the panel coming against the sides of the opposite uprights. Holes are then made with a brace and bit through the upright, and stout screws 3 inches, or even 3½ inches, long are driven through into the standards of the panel, so that the sides of the panel's standards are drawn closely to the uprights from top to bottom. The projecting ends of the battens are also screwed to the sides of the uprights. Let me remind the maker of the shed that the screws should be well greased before insertion, so that they may be the more easily withdrawn

Attachment of panels to uprights at corners

in case of taking down and removing the shed from one place to another. In this manner the sides of the shed as well as the front and back are secured to the uprights, so that the whole structure is firm and solid, rigid and immovable. I must add that the corner uprights should be buried in the ground to the depth of 18 inches or more, and that it will be better to nail pieces to them, so as to give them a better bearing below ground, and to prevent all chance of the shed suffering displacement through any sudden storm with which it may be assailed.

948. In order to fix the roof, the sloping pieces that receive it should be notched to receive the battens of the parts that traverse it, and pieces of quartering should be screwed to the exterior of the gables, through which bolts should be passed, so that the roof can be securely held to front and back by bolts and nuts. The bolts should be passed through the battens, and the nuts screwed up to their utmost limit on the bolts when the roof is making, and the bolts themselves should be of sufficient length to drop into place and protrude on the lower side of the quartering fixed to the gable ends sufficiently firm to take the nuts. If deemed advisable for the sake of strength and security, rafters could be raised within on the side panels from the intermediate standards to receive other bolts passed through the intermediate quartering of the roof, or the interior battens that cross it, the bolts being put in the battens during the process of making the roof. To place the bolts so that they will drop readily into the holes made for their reception, is a difficult job, I know; but it is one that can be managed. Moreover, there is no occasion to have too many of them. The mode of making, hanging, stopping, and fastening the door needs no description.

How to fix the roof.



CHAPTER IX.

PIGEONS THEIR HOMES AND HOUSES ATTACHED TO AND APART FROM BUILDINGS.

Homes and Housings for Pigeons Pigeon House under Gable End of House Pigeon House of Tub on Pole Alighting Boards attached to Tub Top of House Construction of Interior of Tub -Pole supporting Cask Pigeon House formed of Boxes placed Diagonally– Conclusion

Homes and housings for pigeons.

949. BUT little now remains to be said, and that little deals wholly and solely with pigeons. I shall content myself with describing and illustrating a few housings for pigeons outside - houses which will take the form of two kinds: firstly, pigeon boxes that are attached to houses, and pigeon boxes on poles that are entirely detached from, and in no way connected with, houses; and of each of these I shall give two examples. Much has been said about the destructiveness of the pigeon in pecking away the mortar between the bricks of houses, but I have never seen much harm done by them myself in this way, and if any at all is done, it does not amount to much when taken at its utmost.

950. The first of these examples is a plain house for pigeons, to be attached to a wall near to the eaves of a house, but the position chosen for it should be inaccessible to cats, or used only in houses in which cats are not kept. The diagrams given are drawn on a scale of $\frac{3}{4}$ inch to 1 foot. The box shown measures 44 inches in length, and 9 inches in height in front and 12 behind, giving a fall of 3 inches for the roof itself. Each box is 10 inches in width within and 10 inches in depth, which affords room enough for a pair of pigeons. Little need be said about its construction, for that is self-evident from the illustrations given in Figs. 565 and 566, which represent respectively

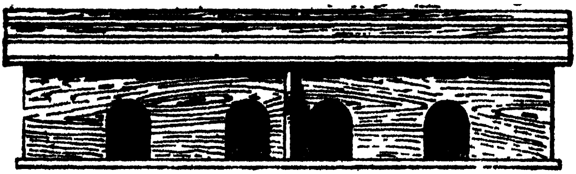


FIG. 565. Plain House for Pigeons –Front Elevation—to be attached to Walls of House.

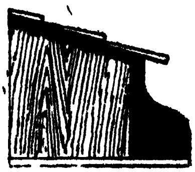


FIG. 566. Plain House for Pigeons End Elevation.

the front elevation and the end elevation. It is nothing more than a plain box, consisting of boards nailed together, the boards being ¾ inch full in thickness. The roof is weather boarded, and overhangs the box well in front and at the sides to the extent of 3 inches in the former and 1½ inches in the latter. The bottom board of the house is 15 inches in width, which admits of a projection of 5 inches for the alighting board. The ramped board is introduced between the central houses or boxes to prevent the pigeons lodged in each from pecking or in any way annoying each other.

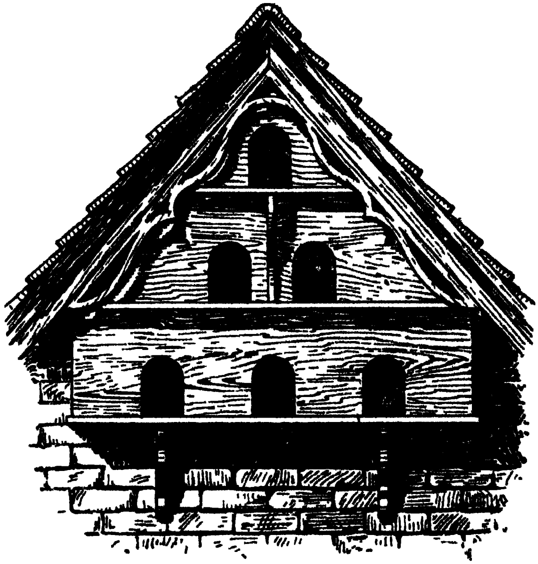


Fig. 567 Plain Pigeon House under Gable End of House

Pigeon house under gable end of house.

951. In Fig. 567 a pigeon house is shown for fitting under a gable end of a house; but, as far as the gable end is concerned, this is entirely hypothetical, and the home carpenter who builds such a house for the accommodation of his pigeons must suit his measurements and the construction, or rather level, of the roof of the pigeon house to the slope of the roof of the house itself. This diagram, like the last, is drawn to a scale of ¼ inch to 1 foot, and is also perfectly plain in construction—the several parts and boards of which it is constructed being all nailed together end to end. The roof of the house is supposed to project to a sufficient distance to cover the roof of the pigeon house and the slight ornamental barge-board attached to it, the alighting boards alone projecting beyond the overhanging roof of the house and being cut into by the barge boards. In this the accommodation in the lowest tier of nest boxes is precisely the same as in the last example, the tier itself being 33 inches long, and the compartments each 10 inches in width. This measurement allows ¾ inch in thickness for the boards of which the house is constructed. The height of the boxes between floor and floor is 9 inches. A ramped board is placed between the closely adjacent holes in the second tier of nest boxes, for reasons already

given. The entrance holes to all the boxes in this, and in the house previously described, are 5 inches in height and 3½ inches in width. The depth of the boxes, including boarding at front and back in both examples given, is 10 inches. The alighting boards project in front to the distance of 5 inches, but 4 inches will be sufficient in all cases. The boxes should be hung from stout hooks or heavy nails driven into the walls of the houses in a slightly slanting direction, holes being made in the backs of the boxes, through which the heads of the nails are passed. This completes the description of dependent pigeon boxes or houses, that is to say, boxes which are dependent for support on attachment to houses. *Quasi* brackets are attached to the floor board of the house shown in Fig. 567, to give a semblance of support from without, but the house is as well without them as with them. When used they may be ornamental brackets of iron screwed to the lower side of the floor board of the first tier.

952. And now we are brought to pigeon houses on poles houses that are altogether different from those already described, and which, being entirely detached and independent in themselves, require more minuteness of description in all the details of their construction. Of such houses as these I shall also give two examples. Let us first take the tub, converted into a pigeon house and erected on a pole running through its centre. For making such a house as this, a stout cask is required, either a paraffin cask or a cask in which flour has been sent from America, but the former is, I think, to be preferred. Being shown on a scale of ¼ inch to a foot in the diagrams, the cask figured in Fig. 568 is 29 inches in height and 23 inches in diameter in its widest part. There are three floors, and I should recommend the re-hooping of the cask in the positions shown before commencing operations; that is to say, a stout hoop 1 inch in width at the top and bottom, and two intermediate hoops, one having *its rim at the upper part* just 8 inches below the *lower* rim of the top hoop, and the other having *its top rim* just 9 inches *below the bottom rim* of the first intermediate hoop. This will ensure the division of the cask within

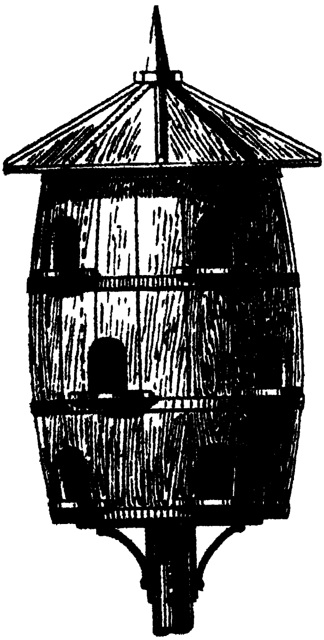


FIG. 568. Pigeon House in Tub on Pole.

into three tiers of very nearly equal heights, if they are not exactly equal; at all events, for all practical purposes, let us assume that they are equal. Let us take the exterior of the pigeon house, as shown in Fig. 568, first of all. In this the holes that give access to the boxes in the interior are placed diametrically opposite each other in each tier, and also equi-distant, as may be inferred from the illustration given in Fig. 568. The vertical boards of division between the nests are placed *between* the entrances in each tier up and down, and the staves of the cask, against which they respectively abut, are strongly nailed to them in the dotted lines shown in the diagram. To prevent omission when describing the mode of making the interior, it may be as well to say that these are stout boards of 1 inch in thickness. The entrance holes in each case in the interior are placed ¾ inch above the top rim of the bottom and two intermediate hoops, and outside each entrance are alighting boards, 5 inches wide and 10 inches in extreme length, cut in the shape shown in Fig. 569, so that they may be attached to the tub at each end, and so securely fixed. The cap, or cover, is octagonal in shape, and consists of eight boards, cut of the shape shown, and nailed or screwed to a framing within made of slanting pieces with transverse pieces fixed to them at top and bottom. The ends of the slanting pieces should run deeply down the interior of the tub, or at least far enough to admit of their being secured to the tub by screws inserted from without it. This must not be done, however, until the interior is completed. Then the external boarding may be fixed to them, and the junction of adjacent boards secured against the intrusion of rain by capping. The roof should project about 3 inches beyond the exterior of the tub.

Pigeon house of tub on pole.

Alighting boards attached to tub.

Top of house.

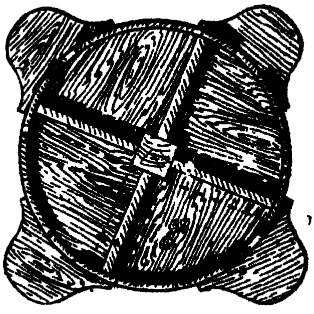


Fig. 569. Section of Pigeon House in Tub on Pole.

953. We are now brought to a consideration of the method of dealing with the interior of the tub. To do this, cut four pieces of boards to the length of the cask, and let these pieces be 9 inches wide *full*, and 1 inch thick. The length will be the height of the tub from within, and, as the tub was supposed to be 29 inches in height externally, this will be under 28 inches internally, and even then the boards will be found to project slightly beyond the top of the cask. Advantage, however, may be taken of this to secure the ends of four of the pieces of the framing of the capping to them.

Construction of interior of tub.

Carefully mark these boards, so as to correspond with the entrance holes near which they come, after shaping and moulding the outer edge to the shape of the interior of the tub, in such a manner that the interior of the tub may fit closely against them. Then, at the distance of ¾ inch below the transverse marks, which indicate the level of the holes, draw parallel lines, and, touching these last made lines, nail ledges to the boards on both sides, as shown in Fig. 569, which represents a section of the pigeon house on a level with either the top series, or central series, of holes. Pass these boards into the cask, and nail the cask firmly to them, taking care to keep the boards vertical and equi-distant.

Pole supporting cask.

954. Now, introduce the pole which supports the cask. This should be, at least, 15 feet in height below the cask, which allows for 3 feet below ground, and 12 feet above to the bottom of the cask. Let the pole be 4 feet longer than this, which will make its length, when taken as a whole, 19 feet; have the 4 feet of pole at the top carefully squared, by cutting away the sides. When put in, it should fit firmly against the interior edges of the vertical boards, which should be skew-nailed to the squared sides of the pole. Nothing now remains but to put in the floors of the compartments, which will fit and fall on to the ledges already nailed to the sides of the vertical boards, and be nailed to the ledges. A little difficulty may be found in putting the floors through the top of the cask, but a little manœuvring and coaxing will get them in, and when in they will be found to fit well and tightly. Trim off the top of the pole, as shown in Fig. 568. Then put on the roof, and secure the junction of roof with pole against the entrance of rain by a capping, as shown in the illustration. A pigeon house made in this way will be found to be a stout, strong, and serviceable structure. The tub should be supported from below by strong iron brackets, as shown in the illustration, screwed to the pole and to the bottom of the tub.

Pigeon house formed of boxes placed diagonally.

955. The last example that I give shows a pigeon house of quaint, but pretty and effective appearance, formed of boxes placed one above another, every successive box being set diagonally over the box below it. Its construction is so simple, and shown so exactly in Figs. 570 and 571, that very little need be said about it. The diagrams, moreover, are drawn, as are the preceding ones given in this chapter, to a scale of ¾ inch to 1 foot, so that the proportions of each may be ascertained at once by measurement by means of a suitable scale. Working from the plan of the central box, as shown in Fig. 571, it will be seen at once that each box is 20 inches square, and, being formed of boards ¾ inch thick, shows

chamber room within of just about 11 inches by 7 inches, the entrance hole to each chamber being made in the centre of the front, 3 inches in width. The boxes are 9 inches in height externally, including top and bottom. No framing whatever is required in their construction, so that each separate box is very easily made. A bottom of 20 inches square and $\frac{3}{4}$ inch thick is first put together, and this is nailed to the sides, which are 7½ inches in height, and in which the entrance holes—4½ inches in height and 3 inches wide—have been previously cut. The boards forming the compartments are then put in, and are so set as to leave a space 3 inches square in the centre for the insertion of the squared pole, which is formed in precisely the same manner as that in the preceding example, the lowest box being supported by strong iron brackets, which are screwed securely both to box and pole. The projecting corners of each box form the alighting boards for entering the compartments of the box above, except in the case of the lowest box, in which the bottom must be so formed as to furnish the alighting boards, or pieces screwed on below to serve the same purpose. In the process of making, each box may be screwed - the bottom of the upper to the top of the lower—to the box immediately below it Finally, the roof may be put on as shown, overhanging the topmost box to the extent of 2 or 3 inches. The top may then be shaped as shown, the projecting parts being formed of mopstick moulding mitred together, and the grooved part taken out of the top of the pole. The construction of the roof is apparent from the illustration given in Fig. 570. This is all that need be said with reference to the construction of this easily made, but pretty looking, pigeon house.

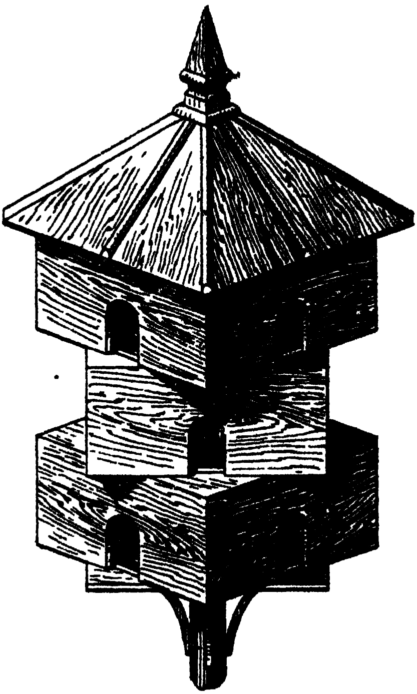


Fig. 570 Pigeon House formed of Boxes placed one upon another.

956. And, now, having reached the end of this long work, dare I, in reference to this and its predecessor, *Every Man His Own Mechanic*, to which it forms a fitting and becoming sequel, echo the bold and proud words of the

Venusian poet Horace, and say: *Exegi monimentum ære perennius?* No, I dare not, because his writings will be read and remembered throughout all time; **Conclusion.** whereas mine, in all probability, will be forgotten and elbowed out in a few short years, by the forthcoming of other books on the same subjects, written with far more power and minuteness, and with much greater ability than I am able to bring to bear upon them. Still, when I remember that I have helped my fellow-countrymen in this my generation, not only to build and make for themselves, but in many cases to earn a living, and that it has been placed on undying record which cannot be broken, that "Whosoever shall give to drink unto one of these little ones a cup of cold water only in the name of a disciple, verily, I say unto you, he shall in no wise lose his reward," when I remember that the books which I have written—and they are many in number—have been written fully, freely, and ungrudgingly as regards time and space, written as unto God and not as unto men, I am more than satisfied and content.

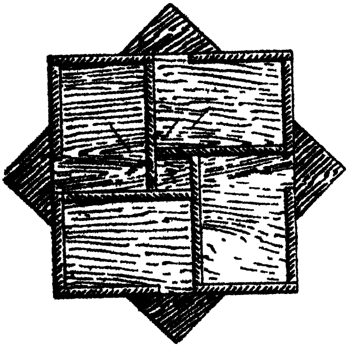


FIG. 571 Plan of Central Box shown resting on the top of Box below.

The End

GENERAL INDEX.

☛ IN THIS INDEX, REFERENCE IS MADE TO THE SECTIONS, EACH OF WHICH IS NUMBERED AT THE COMMENCEMENT, AND NOT TO THE PAGES OF THE BOOK.

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